AD-A034 246 MCDERMOTT (J RAY) CO INC NEW ORLEANS LA F/G 13/10
ENGINEERING DESIGN CALCULATIONS MONO-MOORING SYSTEM. VOLUME 5. --ETC(U)
1966 DA-44-009-AMC-841(T)
UNCLASSIFIED NL

1 OF 3
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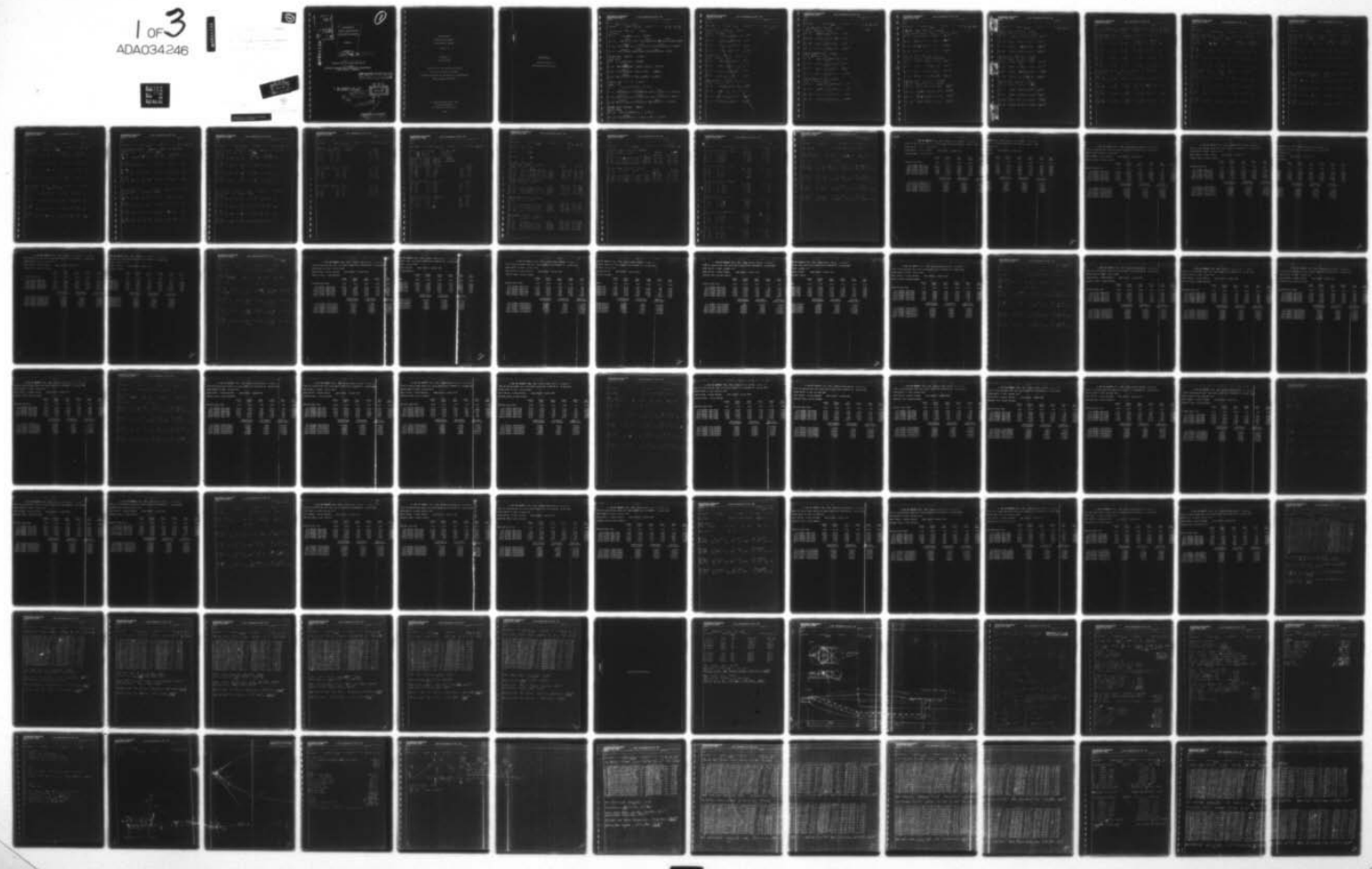

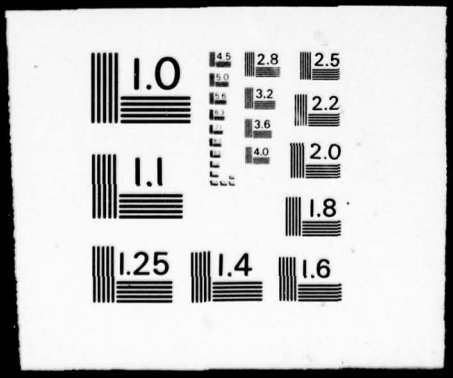


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(6) ENGINEERING
DESIGN CALCULATIONS
MONO-MOORING SYSTEM,

VOLUME 5,

APPENDIX A,
TO
(9) FINAL REPORT, On Phase 1,

(15) Contract No. DA-44-009-AMC-841(T)

U. S. ARMY
ENGINEER RESEARCH AND DEVELOPMENT LABORATORIES
FORT BELVOIR, VIRGINIA

J. RAY McDERMOTT & CO., INC.
NEW ORLEANS, LOUISIANA

(12) 326 p.

(11) 1966

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ENGINEERING
DESIGN CALCULATIONS
MONO-MOORING SYSTEM

VOLUME 5

APPENDIX A
to
FINAL REPORT

Contract No. DA-44-009-AMC-841(T)

U. S. ARMY MATERIEL COMMAND

ENGINEER RESEARCH AND DEVELOPMENT LABORATORIES

FORT BELVOIR, VIRGINIA

J. RAY McDERMOTT & CO., INC.
Saratoga Building
New Orleans, Louisiana

1966

SECTION I

PRELIMINARY.

WIND AND CURRENT RESISTANCE CALCULATIONS

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT: WIND RESISTANCE			
DRAWING NUMBER	COMPUTER: N d B	CHECKED BY	DATE: 3-28-66

22,500 DWT TANKER LOADED

WIND AREA

$\chi = 0°$ $770 \times (13.8 + 25.0) = 2,987.6$

$\chi = 10°$ $579.2 \times 0.1737 \times 13.8$ (1388.3) $+ 770 \times 0.9848 \times 25.0$ (1,895.0) $+ 579.2 \times 1.2 \times 0.1737 \times 25.0$ (502.5) $= 3,785.8$

$\chi = 20°$ $579.2 \times 0.3420 \times 13.8$ (2,733.8) $+ 770 \times 0.9397 \times 25.0$ (1,810.0) $+ 579.2 \times 0.2 \times 0.3420 \times 25.0$ (990.0) $= 5,533.8$

$\chi = 30°$ $579.2 \times 0.5 \times 13.8$ (3,996.5) $+ 770 \times 0.8660 \times 25$ (1,667.5) $+ 579.2 \times 0.2 \times 0.5 \times 25.0$ (1,447.5) $= 7,111.5$

22,500 DWT TANKER LIGHT

WIND AREA

$\chi = 0°$ $770 (31.4 + 25.0) = 7,342.8$

$\chi = 10°$ $579.2 \times 0.1737 \times 31.4$ (3,158.8) $+ 1,895.0 + 502.5 = 5,556.3$

$\chi = 20°$ $579.2 \times 0.3420 \times 31.4$ (6,220.3) $+ 1,810.0 + 990.0 = 9,020.3$

$\chi = 30°$ $579.2 \times 0.5 \times 31.4$ (9,093.4) $+ 1,667.5 + 1,447.5 = 12,208.4$

46,000 DWT TANKER LOADED

WIND AREA

$\chi = 0°$ $102.0 \times (15.2 + 25.0) = 4,100.4$

$\chi = 10°$ $736.0 \times 0.1737 \times 15.2$ (1,942.6) $+ 102.0 \times 0.9848 \times 25.0$ (2,510.0) $+ 736.0 \times 0.2 \times 0.1737 \times 25.0$ (640.0) $= 5,092.6$

$\chi = 20°$ $736.0 \times 0.3420 \times 15.2$ (3,825.8) $+ 102.0 \times 0.9397 \times 25.0$ (2,395.0) $+ 736.0 \times 0.2 \times 0.3420 \times 25.0$ (1,257.5) $= 7,478.3$

$\chi = 30°$ $736.0 \times 0.5 \times 15.2$ (5,593.6) $+ 102.0 \times 0.8660 \times 25.0$ (2,207.5) $+ 736.0 \times 0.2 \times 0.5 \times 25.0$ (1,840.0) $= 9,641.1$

46,000 DWT TANKER LIGHT

WIND AREA

$\chi = 0°$ $102.0 \times (36.8 + 25.0) = 6,303.6$

$\chi = 10°$ $736.0 \times 0.1737 \times 36.3$ (4,639.1) $+ 2,510.0 + 640.0 = 7,789.1$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER N dB	CHECKED BY	DATE 3-28-66

22,500 DWT TANKER LOADED
2 KNT CURRENT DRAG

$X = 0°$ $\quad \frac{0.01 \times 1 \times 18,766.1 \times 3^2}{1000} = 1.7^k$

$X = 10°$ $\quad \frac{0.06 \times 1 \times 18,766.1 \times 3^2}{1000} = 10.1^k$

$X = 20°$ $\quad \frac{0.16 \times 1 \times 18,766.1 \times 3^2}{1000} = 27.0^k$

$X = 30°$ $\quad \frac{0.38 \times 1 \times 18,766.1 \times 3^2}{1000} = 64.2^k$

22,500 DWT TANKER LIGHT
2KNT CURRENT DRAG

$X = 0°$ $\quad \frac{0.01 \times 1 \times 6,545.0 \times 3^2}{1000} = 0.6^k$

$X = 10°$ $\quad \frac{0.06 \times 1 \times 6,545.0 \times 3^2}{1000} = 3.5^k$

$X = 20°$ $\quad \frac{0.16 \times 1 \times 6,545.0 \times 3^2}{1000} = 9.4^k$

$X = 30°$ $\quad \frac{0.38 \times 1 \times 6,545.0 \times 3^2}{1000} = 22.4^k$

46,000 DWT TANKER LOADED
2KNT CURRENT DRAG

$X = 0°$ $\quad \frac{0.01 \times 1 \times 27,190.4 \times 3^2}{1000} = 2.4^k$

$X = 10°$ $\quad \frac{0.06 \times 1 \times 27,190.4 \times 3^2}{1000} = 14.7^k$

$X = 20°$ $\quad \frac{0.16 \times 1 \times 27,190.4 \times 3^2}{1000} = 39.1^k$

$X = 30°$ $\quad \frac{0.38 \times 1 \times 27,190.4 \times 3^2}{1000} = 92.8^k$

VOID

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO.
SUBJECT			
DRAWING NUMBER	COMPUTER NdB	CHECKED BY	DATE 3-28-66

46,000 DWT TANKER LIGHT
2 KMT CURRENT DRAG

$X = 0°$ $\frac{0.01 \times 1 \times 9.4776 \times 3^2}{1000} = 0.9^k$

$X = 10°$ $\frac{0.06 \times 1 \times 9.4776 \times 3^2}{1000} = 5.1^k$

$X = 20°$ $\frac{0.16 \times 1 \times 9.4776 \times 3^2}{1000} = 13.6^k$

$X = 30°$ $\frac{0.38 \times 1 \times 9.4776 \times 3^2}{1000} = 32.4^k$

70,000 DWT TANKER LOADED
2 KMT CURRENT DRAG

$X = 0°$ $\frac{0.01 \times 1 \times 36,920.4 \times 3^2}{1000} = 3.3^k$

$X = 10°$ $\frac{0.06 \times 1 \times 36,920.4 \times 3^2}{1000.0} = 19.9^k$

$X = 20°$ $\frac{0.16 \times 1 \times 36,920.4 \times 3^2}{1000} = 53.2^k$

$X = 30°$ $\frac{0.38 \times 1 \times 36,920.4 \times 3^2}{1000} = 126.3^k$

70,000 DWT TANKER LIGHT
2 KMT CURRENT DRAG

$X = 0°$ $\frac{0.01 \times 1 \times 11,076.1 \times 3^2}{1000} = 1.0^k$

$X = 10°$ $\frac{0.06 \times 1 \times 11,076.1 \times 3^2}{1000} = 6.0^k$

$X = 20°$ $\frac{0.16 \times 1 \times 11,076.1 \times 3^2}{1000} = 15.9^k$

$X = 30°$ $\frac{0.38 \times 1 \times 11,076.1 \times 3^2}{1000} = 37.9^k$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY		SHEET NO
SUBJECT		
DRAWING NUMBER	COMPUTER NdB	CHECKED BY / DATE 3-22-66

VOID

22,500 DWT TANKER LOADED
TOTAL WIND & CURRENT DRAG (40 KMT WIND)

$X = 0°$ 1.7 + 2,987.6 × 0.0063 = 20.5 K

$X = 10°$ 10.1 + 3,785.8 × 0.0063 = 34.0 K

$X = 20°$ 27.0 + 5,533.8 × 0.0063 = 61.9 K

$X = 30°$ 64.2 + 7,111.5 × 0.0063 = 109.0 K

22,500 DWT TANKER LIGHT
TOTAL WIND & CURRENT DRAG

$X = 0°$ 0.6 + 4,342.8 × 0.0063 = 28.0 K

$X = 10°$ 3.5 + 5,556.3 × 0.0063 = 38.5 K

$X = 20°$ 9.4 + 9,020.3 × 0.0063 = 66.2 K

$X = 30°$ 22.4 + 12,208.4 × 0.0063 = 99.3 K

46,000 DWT TANKER LOADED
TOTAL WIND & CURRENT DRAG

$X = 0°$ 2.4 + 4,100.4 × 0.0063 = 28.2 K

$X = 10°$ 14.7 + 5,092.6 × 0.0063 = 46.8 K

$X = 20°$ 39.1 + 7,478.3 × 0.0063 = 86.2 K

$X = 30°$ 72.8 + 13,641.1 × 0.0063 = 153.5 K

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER NdB	CHECKED BY	DATE 3-28-66

46,000 DWT TANKER LIGHT
TOTAL WIND & CURRENT DRAG

X = 0° 0.9 + 6,303.6 × 0.0063 = 40.6 K

X = 10° 5.1 + 7,789.1 × 0.0063 = 54.2 K

X = 20° 13.6 + 12,915.1 × 0.0063 = 95.0 K

X = 30° 32.9 + 17,583.9 × 0.0063 = 143.2 K

70,000 DWT TANKER LOADED
TOTAL WIND & CURRENT DRAG

X = 0° 3.3 + 5,060.0 × 0.0063 = 35.2 K

X = 10° 19.9 + 6,472.3 × 0.0063 = 60.3 K

X = 20° 53.2 + 9,754.7 × 0.0063 = 114.7 K

X = 30° 126.3 + 12,798.0 × 0.0063 = 206.9 K

70,000 DWT TANKER LIGHT
TOTAL WIND & CURRENT DRAG

X = 0° 1.0 + 8,399.0 × 0.0063 = 53.6 K

X = 10° 6.9 + 10,679.9 × 0.0063 = 73.3 K

X = 20° 15.9 + 18,157.9 × 0.0063 = 130.3 K

X = 30° 32.9 + 25,081.7 × 0.0063 = 195.9 K

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 3015

J. RAY McDERMOTT & Co., INC.

COMPANY			SHEET NO
SUBJECT: COMPUTER INPUT FOR BUOY MOTION STUDY 0° HEADING			
DRAWING NUMBER	COMPUTER: NdB	CHECKED BY	DATE: 3-28-66

22,500 DWT TANKER LOADED MOORED IN 60' W.D.
PROPERTIES OF MOORING BUOY

$X = 0°$

MASS SU MASS SW

$T_h = 9.65$ $T_P = 11.4$ $T_R = 12.8$ $T_{SU} = 83.7$ $T_{SW} = 83.7$ $T_Y =$

$X = 10°$

$T_h = 9.65$ $T_P = 10.9$ $T_R = 12.8$ $T_{SU} = 83.7$ $T_{SW} = 83.7$ $T_Y =$

$X = 20°$

$T_h = 9.65$ $T_P = 10.1$ $T_R = 12.8$ $T_{SU} = 83.7$ $T_{SW} = 83.7$ $T_Y =$

$X = 30°$

$T_h = 9.65$ $T_P = 9.1$ $T_R = 12.8$ $T_{SU} = 83.7$ $T_{SW} = 83.7$ $T_Y =$

22,500 DWT TANKER LIGHT MOORED IN 60' W.D.
PROPERTIES OF MOORING BUOY

$X = 0°$

$T_h = 9.65$ $T_P = 11.1$ $T_R = 12.8$ $T_{SU} = 83.7$ $T_{SW} = 83.7$ $T_Y =$

$X = 10°$

$T_h = 9.65$ $T_P = 10.75$ $T_R = 12.8$ $T_{SU} = 83.7$ $T_{SW} = 83.7$ $T_Y =$

$X = 20°$

$T_h = 9.65$ $T_P = 10.0$ $T_R = 12.8$ $T_{SU} = 83.7$ $T_{SW} = 83.7$ $T_Y =$

$X = 30°$

$T_h = 9.65$ $T_P = 9.3$ $T_R = 12.8$ $T_{SU} = 83.7$ $T_{SW} = 83.7$ $T_Y =$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & Co., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER NdB	CHECKED BY	DATE 3.28.66

22,500 DWT TANKER LOADED MOORED IN 150' WD
PROPERTIES OF MOORING BUOY.

$X = 0°$
$T_H = 9.8$ $T_P = 9.9$ $T_R = 10.8$ MASS SU $T_{SU} = 84.3$ MASS SW $T_{SW} = 84.3$ $T_Y =$

$X = 10°$
$T_H = 9.8$ $T_P = 9.55$ $T_R = 10.8$ $T_{SU} = 84.3$ $T_{SW} = 84.3$ $T_Y =$

$X = 20°$
$T_H = 9.8$ $T_P = 9.2$ $T_R = 10.8$ $T_{SU} = 84.3$ $T_{SW} = 84.3$ $T_Y =$

$X = 30°$
$T_H = 9.8$ $T_P = 8.25$ $T_R = 10.8$ $T_{SU} = 84.3$ $T_{SW} = 84.3$ $T_Y =$

22,500 DWT TANKER LIGHT MOORED IN 150' WD
PROPERTIES OF MOORING BUOY

$X = 0°$
$T_H = 9.8$ $T_P = 9.7$ $T_R = 10.8$ $T_{SU} = 84.3$ $T_{SW} = 84.3$ $T_Y =$

$X = 10°$
$T_H = 9.8$ $T_P = 9.45$ $T_R = 10.8$ $T_{SU} = 84.3$ $T_{SW} = 84.3$ $T_Y =$

$X = 20°$
$T_H = 9.8$ $T_P = 8.95$ $T_R = 10.8$ $T_{SU} = 84.3$ $T_{SW} = 84.3$ $T_Y =$

$X = 30°$
$T_H = 9.8$ $T_P = 8.4$ $T_R = 10.8$ $T_{SU} = 84.3$ $T_{SW} = 84.3$ $T_Y =$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY | SHEET NO

SUBJECT

DRAWING NUMBER | COMPUTER | CHECKED BY | DATE

46,000 DWT TANKER LOADED MOORED IN 60' WD
PROPERTIES OF MOORING BUOY

X = 0°
T_h = 9.65 T_P = 11.1 T_R = 12.8 T_{SU} = 83.7 T_{SW} = 83.7 T_y =
MASS SU MASS SW

X = 10°
T_h = 9.65 T_P = 10.55 T_R = 12.8 T_{SU} = 83.7 T_{SW} = 83.7 T_y =

X = 20°
T_h = 9.65 T_P = 9.55 T_R = 12.8 T_{SU} = 83.7 T_{SW} = 83.7 T_y =

X = 30°
T_h = 9.65 T_P = 8.4 T_R = 12.8 T_{SU} = 83.7 T_{SW} = 83.7 T_y =

46,000 DWT TANKER LIGHT MOORED IN 60' WD
PROPERTIES OF MOORING BUOY

X = 0
T_h = 9.65 T_P = 10.7 T_R = 12.8 T_{SU} = 83.7 T_{SW} = 83.7 T_y =

X = 10°
T_h = 9.65 T_P = 10.3 T_R = 12.8 T_{SU} = 83.7 T_{SW} = 83.7 T_y =

X = 20°
T_h = 9.65 T_P = 9.4 T_R = 12.8 T_{SU} = 83.7 T_{SW} = 83.7 T_y =

X = 30°
T_h = 9.65 T_P = 8.55 T_R = 12.8 T_{SU} = 83.7 T_{SW} = 83.7 T_y =

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO.
SUBJECT			
DRAWING NUMBER	COMPUTER MdB	CHECKED BY	DATE 3-22-66

46,000 DWT TANKER LOADED MOORED IN 150' WD
PROPERTIES OF MOORING BUOY

$\chi = 0°$ MASS SU MASS SW
$T_n = 9.8$ $T_P = 9.7$ $T_R = 10.8$ $T_{SU} = 84.3$ $T_{SW} = 84.3$ $T_Y =$

$\chi = 10°$
$T_n = 9.8$ $T_P = 9.3$ $T_R = 10.8$ $T_{SU} = 84.3$ $T_{SW} = 84.3$ $T_Y =$

$\chi = 20°$
$T_n = 9.8$ $T_P = 8.6$ $T_R = 10.8$ $T_{SU} = 84.3$ $T_{SW} = 84.3$ $T_Y =$

$\chi = 30°$
$T_n = 9.8$ $T_P = 7.7$ $T_R = 10.8$ $T_{SU} = 84.3$ $T_{SW} = 84.3$ $T_Y =$

46,000 DWT TANKER LIGHT MOORED IN 150' WD
PROPERTIES OF MOORING BUOY

$\chi = 0°$
$T_n = 9.8$ $T_P = 9.45$ $T_R = 10.8$ $T_{SU} = 84.3$ $T_{SW} = 84.3$ $T_Y =$

$\chi = 10°$
$T_n = 9.8$ $T_P = 9.15$ $T_R = 10.8$ $T_{SU} = 84.3$ $T_{SW} = 84.3$ $T_Y =$

$\chi = 20°$
$T_n = 9.8$ $T_P = 8.95$ $T_R = 10.8$ $T_{SU} = 84.3$ $T_{SW} = 84.3$ $T_Y =$

$\chi = 30°$
$T_n = 9.8$ $T_P = 7.8$ $T_R = 10.8$ $T_{SU} = 84.3$ $T_{SW} = 84.3$ $T_Y =$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER NdB	CHECKED BY	DATE 3-22-66

70,000 DWT TANKER LOADED MOORED IN 60' WD
PROPERTIES OF MOORING BUOY

			MASS SU	MASS SW	
$\chi = 0°$					
$T_h = 9.65$	$T_p = 12.85$	$T_R = 12.8$	$T_{SU} = 83.7$	$T_{SW} = 83.7$	$T_y =$
$\chi = 10°$					
$T_h = 9.65$	$T_p = 10.15$	$T_R = 12.8$	$T_{SU} = 83.7$	$T_{SW} = 83.7$	$T_y =$
$\chi = 20°$					
$T_h = 9.65$	$T_p = 9.0$	$T_R = 12.8$	$T_{SU} = 83.7$	$T_{SW} = 83.7$	$T_y =$
$\chi = 30°$					
$T_h = 9.65$	$T_p = 7.75$	$T_R = 12.8$	$T_{SU} = 83.7$	$T_{SW} = 83.7$	$T_y =$

70,000 DWT TANKER LIGHT MOORED IN 60' WD
PROPERTIES OF MOORING BUOY

$\chi = 0°$					
$T_h = 9.65$	$T_p = 10.3$	$T_R = 12.8$	$T_{SU} = 83.7$	$T_{SW} = 83.7$	T_y
$\chi = 10°$					
$T_h = 9.65$	$T_p = 9.8$	$T_R = 12.8$	$T_{SU} = 83.7$	$T_{SW} = 83.7$	$T_y =$
$\chi = 20°$					
$T_h = 9.65$	$T_p = 8.7$	$T_R = 12.8$	$T_{SU} = 83.7$	$T_{SW} = 83.7$	$T_y =$
$\chi = 35°$					
$T_h = 9.65$	$T_p = 7.85$	$T_R = 12.8$	$T_{SU} = 83.7$	$T_{SW} = 83.7$	$T_y =$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER NdO	CHECKED BY	DATE 3-28-66

70,000 DWT TANKER LOADED MOORED IN 150' WD
PROPERTIES OF MOORING BUOY

X = 0°

			MASS SU	MASS SW	
T_n = 9.8	T_p = 9.5	T_R = 10.1	T_{SU} = 84.3	T_{SW} = 84.3	T_Y =

X = 10°

T_n = 9.8	T_p = 9.0	T_R = 10.1	T_{SU} = 84.3	T_{SW} = 84.3	T_Y =

X = 20°

T_n = 9.8	T_p = 8.15	T_R = 10.1	T_{SU} = 84.3	T_{SW} = 84.3	T_Y =

X = 30°

T_n = 9.8	T_p = 7.2	T_R = 10.1	T_{SU} = 84.3	T_{SW} = 84.3	T_Y =

70,000 DWT TANKER LIGHT MOORED IN 150' WD
PROPERTIES OF MOORING BUOY

X = 0°

T_n = 9.8	T_p = 9.15	T_R = 10.8	T_{SU} = 84.3	T_{SW} = 84.3	T_Y =

X = 10°

T_n = 9.8	T_p = 8.8	T_R = 10.1	T_{SU} = 84.3	T_{SW} = 84.3	T_Y =

X = 20°

T_n = 9.8	T_p = 8.0	T_R = 10.1	T_{SU} = 84.3	T_{SW} = 84.3	T_Y =

X = 30°

T_n = 9.8	T_p = 7.3	T_R = 10.1	T_{SU} = 84.3	T_{SW} = 84.3	T_Y =

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER NdB	CHECKED BY	DATE 3-28-66

PERIOD OF SURGE 150' WD

22,500 DWT TANKER LOADED

		LIGHT
$\chi = 0°$	TSU = 17.1	TSU = 16.2
$\chi = 10°$	TSU = 15.6	TSU = 15.2
$\chi = 20°$	TSU = 13.35	TSU = 13.1
$\chi = 30°$	TSU = 10.8	TSU = 11.2

46,000 DWT TANKER LOADED

		LIGHT
$\chi = 0°$	TSU = 16.1	TSU = 15.05
$\chi = 10°$	TSU = 14.5	TSU = 13.9
$\chi = 20°$	TSU = 11.9	TSU = 11.95
$\chi = 30°$	TSU = 8.85	TSU = 9.25

70,000 DWT TANKER LOADED

		LIGHT
$\chi = 0°$	TSU = 15.5	TSU = 14.0
$\chi = 10°$	TSU = 13.5	TSU = 12.6
$\chi = 20°$	TSU = 10.5	TSU = 9.6
$\chi = 30°$	TSU = 7.0	TSU = 7.4

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER N dB	CHECKED BY	DATE 3-28-66

BUOY PROPERTIES $L = B = 40'$

Δ 60' WD = 1,342.9 K

Δ 150' WD = 1,352.0 K

PERIOD OF SWAY 60' WD = 19.6 SEC.

PERIOD OF SWAY 150' WD = 21.7 SEC

PERIOD OF SURGE 60' WD

22,500 DWT TANKER LOADED

		LIGHT	
$X = 0°$	$T_{SU} = 15.25$	$T_{SU} =$	14.3
$X = 10°$	$T_{SU} = 13.8$	$T_{SU} =$	13.4
$X = 20°$	$T_{SU} = 11.8$	$T_{SU} =$	11.5
$X = 30°$	$T_{SU} = 9.25$	$T_{SU} =$	9.75

46,000 DWT TANKER LOADED

		LIGHT	
$X = 0°$	$T_{SU} = 14.3$	$T_{SU} =$	13.2
$X = 10°$	$T_{SU} = 12.7$	$T_{SU} =$	12.2
$X = 20°$	$T_{SU} = 10.4$	$T_{SU} =$	10.0
$X = 30°$	$T_{SU} = 7.3$	$T_{SU} =$	7.7

70,000 DWT TANKER LOADED

		LIGHT	
$X = 0°$	$T_{SU} = 13.7$	$T_{SU} =$	12.3
$X = 10°$	$T_{SU} = 11.85$	$T_{SU} =$	11.1
$X = 20°$	$T_{SU} = 9.0$	$T_{SU} =$	8.3
$X = 30°$	$T_{SU} = 5.7$	$T_{SU} =$	6.0

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER NdB	CHECKED BY	DATE 3-31-66

$\chi = 0°$ $C_L = 0.00$ OK

$\chi = 10°$ $C_L = 0.60$

$\chi = 20°$ $C_L = 1.20$

$\chi = 30°$ $C_L = 1.00$

22,500 DWT TANKER LOADED — 60'WD — 150'WD

2 KNT CURRENT LIFT

$\chi = 0°$	$0.0 \times 1 \times 18,766.1 \times 3^2 \times 0.001 =$	0^k	Tsw = 19.10	Tsw = 21.7
$\chi = 10°$	$0.6 \times 1 \times 18,766.1 \times 3^2 \times 0.001 =$	101.3^k	Tsw = 8.75	Tsw = 11.10
$\chi = 20°$	$1.2 \times 1 \times 18,766.1 \times 3^2 \times 0.001 =$	202.7^k	Tsw = 5.8	Tsw = 7.15
$\chi = 30°$	$1.0 \times 1 \times 18,766.1 \times 3^2 \times 0.001 =$	168.9^k	Tsw = 6.8	Tsw = 8.3

22,500 DWT TANKER LIGHT

2 KNT CURRENT LIFT

$\chi = 0°$		0^k	Tsw = 19.10	Tsw = 21.7
$\chi = 10°$	$0.6 \times 1 \times 6,545.0 \times 3^2 \times 0.001 =$	35.3^k	Tsw = 13.60	Tsw = 15.50
$\chi = 20°$	$1.2 \times 1 \times 6,545.0 \times 3^2 \times 0.001 =$	70.9^k	Tsw = 11.2	Tsw = 12.80
$\chi = 30°$	$1.0 \times 1 \times 6,545.0 \times 3^2 \times 0.001 =$	58.9^k	Tsw = 11.9	Tsw = 13.60

46,000 DWT TANKER LOADED

2 KNT CURRENT LIFT

$\chi = 0°$		0^k	Tsw = 19.10	Tsw = 21.7
$\chi = 10°$	$0.6 \times 27,140.4 \times 3^2 \times 0.001 =$	146.6^k	Tsw = 7.55	Tsw = 9.10
$\chi = 20°$	$1.2 \times 27,140.4 \times 3^2 \times 0.001 =$	293.1^k	Tsw = 4.05	Tsw = 5.00
$\chi = 30°$	$1.0 \times 27,140.4 \times 3^2 \times 0.001 =$	244.3^k	Tsw = 4.80	Tsw = 6.05

46,000 DWT TANKER LIGHT

2 KNT CURRENT LIFT

$\chi = 0°$		0^k	Tsw = 19.10	Tsw = 21.70
$\chi = 10°$	$0.6 \times 9,477.6 \times 3^2 \times 0.001 =$	51.2^k	Tsw = 12.45	Tsw = 14.20
$\chi = 20°$	$1.2 \times 9,477.6 \times 3^2 \times 0.001 =$	102.4^k	Tsw = 9.60	Tsw = 11.10
$\chi = 30°$	$1.0 \times 9,477.6 \times 3^2 \times 0.001 =$	85.3^k	Tsw = 10.45	Tsw = 12.00

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			OK
DRAWING NUMBER	COMPUTER NdB	CHECKED BY	DATE 3-31-66

70,000 DWT TANKER LOADED
2 KNT CURRENT LIFT

			60'WD	150'WD
$\chi = 0°$		$= 0^k$	TSW = 19.10	TSW = 21.70
$\chi = 10°$	$0.6 \times 36,920.4 \times 3^2 \times 0.001 =$	199.4^k	TSW = 5.90	TSW = 7.25
$\chi = 20°$	$1.2 \times 36,920.4 \times 3^2 \times 0.001 =$	398.7^k	TSW = 2.90	TSW = 3.50
$\chi = 30°$	$1.0 \times 36,920.4 \times 3^2 \times 0.001 =$	332.3^k	TSW = 3.55	TSW = 4.30

70,000 DWT TANKER LIGHT
2 KNT CURRENT LIFT

			60'WD	150'WD
$\chi = 0°$		$= 0^k$	TSW = 19.10	TSW = 21.70
$\chi = 10°$	$0.6 \times 11,076.1 \times 3^2 \times 0.001 =$	59.8^k	TSW = 11.90	TSW = 13.55
$\chi = 20°$	$1.2 \times 11,076.1 \times 3^2 \times 0.001 =$	119.6^k	TSW = 8.75	TSW = 10.30
$\chi = 30°$	$1.0 \times 11,076.1 \times 3^2 \times 0.001 =$	99.7^k	TSW = 9.80	TSW = 11.20

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY | SHEET NO 9A

SUBJECT

DRAWING NUMBER | COMPUTER NAB | CHECKED BY | DATE 4-1-66

		60' WD	150 WP
22,500 DWT TANKER LOADED			
X = 0°	P = 0 K	TR = 12.80	TR = 10.80
X = 10°	P = 101.3 K	= 9.75	= 8.75
X = 20°	P = 202.7 K	= 8.25	= 7.65
X = 30°	P = 1689 K	= 8.70	= 7.95
22,500 DWT TANKER LIGHT			
X = 0°	P = 0	TR = 12.80	TR = 10.80
X = 10°	P = 35.3	= 11.30	= 9.90
X = 20°	P = 70.9	= 10.40	= 9.25
X = 30	P = 50.9	= 10.70	= 9.95
46,000 DWT TANKER LOADED			
X = 0	P = 0	TR = 12.80	TR = 10.80
X = 10	P = 146.6	= 9.00	= 8.20
X = 20	P = 293.1	= 7.90	= 6.95
X = 30	P = 299.3	= 7.80	= 7.30
46,000 DWT TANKER LIGHT			
X = 0	P = 0	TR = 12.80	TR = 10.80
X = 10	P = 51.2	= 10.90	= 9.60
X = 20	P = 102.4	= 9.75	= 8.75
X = 30	P = 85.3	= 10.05	= 9.00
70,000 DWT TANKER LOADED			
X = 0	P = 0	TR = 12.80	TR = 10.80
X = 10	P = 199.4	= 8.35	= 7.70
X = 20	P = 398.7	= 6.70	= 6.40
X = 30	P = 332.3	= 7.15	= 6.75
70,000 DWT TANKER LIGHT			
X = 0	P = 0	TR = 12.80	TR = 10.80
X = 10	P = 59.8	= 10.65	= 9.45
X = 20	P = 119.6	= 9.40	= 8.50
X = 30	P = 99.7	= 9.80	= 8.80

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY	SHEET NO. CASE 4
SUBJECT	
DRAWING NUMBER / COMPUTER / CHECKED BY / DATE	

D = 40.0 (22,500 DWT TANKER LIGHT)

W.D. 60'
DISPL 1,347.4 M_1 = 83.7 M_2 = 83.7 M_3 = 1.0

T_W = 10.0 H = 10.0

E = 0.0 X = -16.0 Y = 0.0 A = 389.6
T_{S_1} = 9.65 T_{S_2} = 11.1 T_{S_3} = 12.8 T_{S_4} = 14.3 T_{S_5} = 13.10 T_{S_6} = 1.0

E = 10.0 X = 0.0 Y = -16.0 A = 217.2
T_{S_1} = 9.65 T_{S_2} = 10.75 T_{S_3} = 11.30 T_{S_4} = 13.4 T_{S_5} = 13.60 T_{S_6} = 1.0

E = 20.0 X = 0.0 Y = -16.0 A = 144.8
T_{S_1} = 9.65 T_{S_2} = 10.0 T_{S_3} = 10.90 T_{S_4} = 11.5 T_{S_5} = 11.20 T_{S_6} = 1.0

E = 30.0 X = 0.0 Y = -16.0 A = 72.4
T_{S_1} = 9.65 T_{S_2} = 9.3 T_{S_3} = 10.70 T_{S_4} = 9.75 T_{S_5} = 11.90 T_{S_6} = 1.0

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 0.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-
MAXIMUM AMPLITUDE	8.06	6.61	0.00	2.39	0.00
0.0 DEGREE AMPLITUDE	-5.57	1.13	0.00	-1.12	0.00
30.0 DEGREE AMPLITUDE	-1.90	4.24	0.00	.08	0.00
60.0 DEGREE AMPLITUDE	2.26	6.20	0.00	1.26	0.00
90.0 DEGREE AMPLITUDE	5.83	6.51	0.00	2.11	0.00
120.0 DEGREE AMPLITUDE	7.84	5.07	0.00	2.39	0.00
150.0 DEGREE AMPLITUDE	7.74	2.27	0.00	2.02	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACE
0.0 DEGREE DISPLACEMENT	-1.1226	0.0000	-5.89
30.0 DEGREE DISPLACEMENT	.0848	0.0000	-3.09
60.0 DEGREE DISPLACEMENT	1.2695	0.0000	.53
90.0 DEGREE DISPLACEMENT	2.1141	0.0000	4.01
120.0 DEGREE DISPLACEMENT	2.3922	0.0000	6.42
150.0 DEGREE DISPLACEMENT	2.0293	0.0000	7.18

RMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

DY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

.000 FEET

ONDS WAVE HEIGHT 10.000 FEET

GREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
	8.06	6.61	0.00	2.39	0.00	0.00
	-5.57	1.13	0.00	-1.12	0.00	0.00
	-1.90	4.24	0.00	.08	0.00	0.00
	2.26	6.20	0.00	1.26	0.00	0.00
	5.83	6.51	0.00	2.11	0.00	0.00
	7.84	5.07	0.00	2.39	0.00	0.00
	7.74	2.27	0.00	2.02	0.00	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
ENT	-1.1226	0.0000	-5.8905
ENT	.0848	0.0000	-3.0925
ENT	1.2695	0.0000	.5340
ENT	2.1141	0.0000	4.0175
ENT	2.3922	0.0000	6.4245
ENT	2.0293	0.0000	7.1101

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J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 10.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.07	6.95	1.11	2.88	.48	0.00
0.0 DEGREE AMPLITUDE	-1.80	-6.62	-.99	-1.54	-.25	0.00
30.0 DEGREE AMPLITUDE	-5.49	-6.79	-1.11	-2.55	-.42	0.00
60.0 DEGREE AMPLITUDE	-7.71	-5.14	-.92	-2.88	-.48	0.00
90.0 DEGREE AMPLITUDE	-7.86	-2.11	-.49	-2.43	-.41	0.00
120.0 DEGREE AMPLITUDE	-5.90	1.48	.06	-1.33	-.23	0.00
150.0 DEGREE AMPLITUDE	-2.36	4.67	.61	.11	.01	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-1.5429	-.2525	-1.5307
30.0 DEGREE DISPLACEMENT	-2.5541	-.4257	-5.1892
60.0 DEGREE DISPLACEMENT	-2.8809	-.4849	-7.4574
90.0 DEGREE DISPLACEMENT	-2.4357	-.4141	-7.7273
120.0 DEGREE DISPLACEMENT	-1.3379	-.2324	-5.9267
150.0 DEGREE DISPLACEMENT	.1183	.0116	-2.5380

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 20.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-
MAXIMUM AMPLITUDE	8.07	7.31	2.57	4.55	1.80
0.0 DEGREE AMPLITUDE	5.37	3.88	-1.05	.38	0.00
30.0 DEGREE AMPLITUDE	1.63	6.46	-2.08	-1.94	-.90
60.0 DEGREE AMPLITUDE	-2.53	7.30	-2.55	-3.74	-1.86
90.0 DEGREE AMPLITUDE	-6.02	6.19	-2.34	-4.54	-1.80
120.0 DEGREE AMPLITUDE	-7.90	3.42	-1.50	-4.12	-1.55
150.0 DEGREE AMPLITUDE	-7.66	-.26	-.26	-2.60	-.89

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	.3807	-.0026	5.6648
30.0 DEGREE DISPLACEMENT	-1.9422	-.9030	2.2192
60.0 DEGREE DISPLACEMENT	-3.7448	-1.5615	-1.8210
90.0 DEGREE DISPLACEMENT	-4.5440	-1.8016	-5.3732
120.0 DEGREE DISPLACEMENT	-4.1255	-1.5589	-7.4857
150.0 DEGREE DISPLACEMENT	-2.6017	-.8985	-7.5924

C DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

60.000 FEET

SECONDS WAVE HEIGHT 10.000 FEET

0 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
	8.07	7.31	2.57	4.55	1.80	0.00
TUDE	5.37	3.88	-1.05	.38	0.00	0.00
TUDE	1.63	6.46	-2.08	-1.94	-.90	0.00
TUDE	-2.53	7.30	-2.55	-3.74	-1.56	0.00
TUDE	-6.02	6.19	-2.34	-4.54	-1.80	0.00
TUDE	-7.90	3.42	-1.50	-4.12	-1.55	0.00
TUDE	-7.66	-.26	-.26	-2.60	-.89	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
ACEMENT	.3807	-.0026	5.6648
ACEMENT	-1.9422	-.9030	2.2192
ACEMENT	-3.7448	-1.5615	-1.8210
ACEMENT	-4.5440	-1.8016	-5.3732
ACEMENT	-4.1255	-1.5589	-7.4857
ACEMENT	-2.6017	-.8985	-7.5924

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J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 30.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-
MAXIMUM AMPLITUDE	8.08	6.86	3.59	5.86	2.17
0.0 DEGREE AMPLITUDE	8.06	-.57	1.95	-1.75	1.91
30.0 DEGREE AMPLITUDE	7.21	2.92	.18	1.27	1.14
60.0 DEGREE AMPLITUDE	4.42	5.63	-1.63	3.96	.06
90.0 DEGREE AMPLITUDE	.45	6.84	-3.01	5.59	-1.02
120.0 DEGREE AMPLITUDE	-3.64	6.21	-3.58	5.72	-1.84
150.0 DEGREE AMPLITUDE	-6.76	3.92	-3.20	4.31	-2.16

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-1.7577	1.9109	7.5216
30.0 DEGREE DISPLACEMENT	1.2731	1.1400	7.1614
60.0 DEGREE DISPLACEMENT	3.9628	.0635	4.8822
90.0 DEGREE DISPLACEMENT	5.5907	-1.0298	1.2949
120.0 DEGREE DISPLACEMENT	5.7206	-1.8473	-2.6394
150.0 DEGREE DISPLACEMENT	4.3176	-2.1698	-5.8665

RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

LATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

T BUOY 60.000 FEET

10.000 SECONDS WAVE HEIGHT 10.000 FEET

30.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
TUDE	8.08	6.86	3.59	5.86	2.17	0.00
AMPLITUDE	8.06	-.57	1.95	-1.75	1.91	0.00
AMPLITUDE	7.21	2.92	.18	1.27	1.14	0.00
AMPLITUDE	4.42	5.63	-1.63	3.96	.06	0.00
AMPLITUDE	.45	6.84	-3.01	5.59	-1.02	0.00
AMPLITUDE	-3.64	6.21	-3.58	5.72	-1.84	0.00
AMPLITUDE	-6.76	3.92	-3.20	4.31	-2.16	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
DISPLACEMENT	-1.7577	1.9109	7.5216
DISPLACEMENT	1.2731	1.1400	7.1614
DISPLACEMENT	3.9628	.0635	4.8822
DISPLACEMENT	5.5907	-1.0298	1.2949
DISPLACEMENT	5.7206	-1.8473	-2.6394
DISPLACEMENT	4.3176	-2.1698	-5.8665

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ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCE 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO CAE3
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

D = 40' (22,500 DWT TANKER LOADED)

W.D. 60'

DISPL 1,347.4 M_1 = 83.7 M_2 = 83.7 M_3 = 1.0

Tw = 10.0 H = 10.0

E = 0.0

TS_1 = 9.65 TS_2 = 11.4 TS_3 = 12.8 TS_4 = 15.25 TS_5 = 19.10 TS_6 = 1.0

X = -16.0 Y = 0 A = 389.6

E = 10.0

TS_1 = 9.65 TS_2 = 10.9 TS_3 = 9.75 TS_4 = 13.8 TS_5 = 8.75 TS_6 = 1.0

X = 0.0 Y = -16.0 A = 217.2

E = 20.0

TS_1 = 9.65 TS_2 = 10.1 TS_3 = 8.25 TS_4 = 11.8 TS_5 = 5.8 TS_6 = 1.0

X = 0.0 Y = -16.0 A = 144.8

E = 30.0

TS_1 = 9.65 TS_2 = 9.1 TS_3 = 8.70 TS_4 = 9.25 TS_5 = 6.8 TS_6 = 1.0

X = 0.0 Y = -16.0 A = 72.9

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 0.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-
MAXIMUM AMPLITUDE	8.06	6.21	0.00	1.98	0.00
0.0 DEGREE AMPLITUDE	-5.57	.59	0.00	-1.00	0.00
30.0 DEGREE AMPLITUDE	-1.90	3.61	0.00	-.01	0.00
60.0 DEGREE AMPLITUDE	2.26	5.65	0.00	.98	0.00
90.0 DEGREE AMPLITUDE	5.83	6.18	0.00	1.71	0.00
120.0 DEGREE AMPLITUDE	7.84	5.05	0.00	1.98	0.00
150.0 DEGREE AMPLITUDE	7.74	2.57	0.00	1.72	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-1.0037	0.0000	-5.7400
30.0 DEGREE DISPLACEMENT	-.0119	0.0000	2.9168
60.0 DEGREE DISPLACEMENT	.9831	0.0000	.6880
90.0 DEGREE DISPLACEMENT	1.7147	0.0000	4.1085
120.0 DEGREE DISPLACEMENT	1.9803	0.0000	8.4281
150.0 DEGREE DISPLACEMENT	1.7266	0.0000	7.0253

AY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

ATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

BUOY 60.000 FEET

0.000 SECONDS WAVE HEIGHT 10.000 FEET

0.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
UDE	8.06	6.21	0.00	1.98	0.00	0.00
AMPLITUDE	-5.57	.59	0.00	-1.00	0.00	0.00
AMPLITUDE	-1.90	3.61	0.00	-.01	0.00	0.00
AMPLITUDE	2.26	5.65	0.00	.98	0.00	0.00
AMPLITUDE	5.83	6.18	0.00	1.71	0.00	0.00
AMPLITUDE	7.84	5.05	0.00	1.98	0.00	0.00
AMPLITUDE	7.74	2.57	0.00	1.72	0.00	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	RTICAL DISPLACEMENT
DISPLACEMENT	-1.0037	0.0000	5.7400
DISPLACEMENT	-.0119	0.0000	2.9168
DISPLACEMENT	.9831	0.0000	.6880
DISPLACEMENT	1.7147	0.0000	4.1085
DISPLACEMENT	1.9868	0.0000	8.4281
DISPLACEMENT	1.7266	0.0000	7.0253

2

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 10.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-
MAXIMUM AMPLITUDE	8.07	6.76	1.38	2.62	1.08
0.0 DEGREE AMPLITUDE	-1.80	-6.34	1.38	-1.33	.99
30.0 DEGREE AMPLITUDE	-5.49	-6.66	1.17	-2.28	.64
60.0 DEGREE AMPLITUDE	-7.71	-5.20	.65	-2.62	.12
90.0 DEGREE AMPLITUDE	-7.86	-2.34	-.04	-2.26	-.42
120.0 DEGREE AMPLITUDE	-5.90	1.14	-.73	-1.29	-.86
150.0 DEGREE AMPLITUDE	-2.36	4.32	-1.22	.02	-1.07

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-1.3335	.9931	-2.1955
30.0 DEGREE DISPLACEMENT	-2.2872	.6463	-5.8276
60.0 DEGREE DISPLACEMENT	-2.6281	.1263	-7.8982
90.0 DEGREE DISPLACEMENT	-2.2647	-.4275	-7.8525
120.0 DEGREE DISPLACEMENT	-1.2945	-.8668	-5.7027
150.0 DEGREE DISPLACEMENT	.0224	-1.0738	-2.0248

RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

LATION. BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

T BUOY 60.000 FEET

10.000 SECONDS WAVE HEIGHT 10.000 FEET

10.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
TUDE	8.07	6.76	1.38	2.62	1.08	0.00
AMPLITUDE	-1.80	-6.34	1.38	-1.33	.99	0.00
AMPLITUDE	-5.49	-6.66	1.17	-2.28	.64	0.00
AMPLITUDE	-7.71	-5.20	.65	-2.62	.12	0.00
AMPLITUDE	-7.86	-2.34	-.04	-2.26	-.42	0.00
AMPLITUDE	-5.90	1.14	-.73	-1.29	-.86	0.00
AMPLITUDE	-2.36	4.32	-1.22	.02	-1.07	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
DISPLACEMENT	-1.3335	.9931	-2.1955
DISPLACEMENT	-2.2872	.6463	-5.8276
DISPLACEMENT	-2.6281	.1263	-7.8982
DISPLACEMENT	-2.2647	-.4275	-7.8525
DISPLACEMENT	-1.2945	-.8668	-5.7027
DISPLACEMENT	.0224	-1.0738	-2.0248

2

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 20.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-
MAXIMUM AMPLITUDE	8.07	7.24	2.49	4.19	1.23
0.0 DEGREE AMPLITUDE	5.37	-3.63	2.27	.65	1.23
30.0 DEGREE AMPLITUDE	1.63	-6.28	2.47	-1.50	1.07
60.0 DEGREE AMPLITUDE	-2.53	-7.24	2.02	-3.26	.63
90.0 DEGREE AMPLITUDE	-6.02	-6.27	1.02	-4.14	.01
120.0 DEGREE AMPLITUDE	-7.90	-3.61	-.24	-3.91	-.60
150.0 DEGREE AMPLITUDE	-7.66	0.00	-1.45	-2.63	-1.06

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	.6507	1.2368	4.7375
30.0 DEGREE DISPLACEMENT	-1.5073	1.0783	.9451
60.0 DEGREE DISPLACEMENT	-3.2615	.6309	-3.1003
90.0 DEGREE DISPLACEMENT	-4.1418	.0143	-6.3151
120.0 DEGREE DISPLACEMENT	-3.9123	-.6059	-7.8378
150.0 DEGREE DISPLACEMENT	-2.6345	-1.0639	-7.2603

AY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

ATION. BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

BUOY 60.000 FEET

0.000 SECONDS WAVE HEIGHT 10.000 FEET

20.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
IDE	8.07	7.24	2.49	4.19	1.23	0.00
AMPLITUDE	5.37	-3.63	2.27	.65	1.23	0.00
AMPLITUDE	1.63	-6.28	2.47	-1.50	1.07	0.00
AMPLITUDE	-2.53	-7.24	2.02	-3.26	.63	0.00
AMPLITUDE	-6.02	-6.27	1.02	-4.14	.01	0.00
AMPLITUDE	-7.90	-3.61	-.24	-3.91	-.60	0.00
AMPLITUDE	-7.66	0.00	-1.45	-2.63	-1.06	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
DISPLACEMENT	.6507	1.2368	4.7375
DISPLACEMENT	-1.5073	1.0783	.9451
DISPLACEMENT	-3.2615	.6309	-3.1003
DISPLACEMENT	-4.1418	.0143	-6.3151
DISPLACEMENT	-3.9123	-.6059	-7.8378
DISPLACEMENT	-2.6345	-1.0639	-7.2603

2

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 30.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.08	6.81	3.84	5.76	2.13	0.00
0.0 DEGREE AMPLITUDE	8.06	-.09	.45	-.43	1.14	0.00
30.0 DEGREE AMPLITUDE	7.21	3.32	2.29	2.49	1.88	0.00
60.0 DEGREE AMPLITUDE	4.42	5.85	3.53	4.75	2.12	0.00
90.0 DEGREE AMPLITUDE	.45	6.81	3.81	5.74	1.79	0.00
120.0 DEGREE AMPLITUDE	-3.64	5.94	3.08	5.19	.98	0.00
150.0 DEGREE AMPLITUDE	-6.76	3.48	1.51	3.25	-.08	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-.4374	1.1423	7.9421
30.0 DEGREE DISPLACEMENT	2.4940	1.8890	6.5717
60.0 DEGREE DISPLACEMENT	4.7571	2.1296	3.4405
90.0 DEGREE DISPLACEMENT	5.7456	1.7996	-.6126
120.0 DEGREE DISPLACEMENT	5.1946	.9873	-4.5015
150.0 DEGREE DISPLACEMENT	3.2516	-.0894	-7.1843

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY | SHEET NO CASE 8

SUBJECT

DRAWING NUMBER | COMPUTER | CHECKED BY | DATE

D = 40.0 (70,000 DWT TANKER LIGHT)

W.D = 60.0

DISPL = 13479 M_1 = 83.7 M_1 = 83.7 M_3 = 1.0

Tw = 12.0 H = 10.0

E = 0.0 X = -16.0 Y = 0.0 A = 519.55

TS_1 = 9.65 TS_2 = 10.30 TS_3 = 12.80 TS_4 = 12.30 TS_5 = 19.10 TS_6 = 1.0

E = 10.0 X = 0.0 Y = -16.0 A = 314.66

TS_1 = 9.65 TS_2 = 9.8 TS_3 = 10.65 TS_4 = 11.1 TS_5 = 11.90 TS_6 = 1.0

E = 20.0 X = 0.0 Y = -16.0 A = 209.77

TS_1 = 9.65 TS_2 = 8.7 TS_3 = 9.40 TS_4 = 8.3 TS_5 = 8.75 TS_6 = 1.0

E = 30.0 X = 0.0 Y = -16.0 A = 104.89

TS_1 = 9.65 TS_2 = 7.85 TS_3 = 9.80 TS_4 = 6.0 TS_5 = 9.80 TS_6 = 1.0

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 0.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.04	5.23	0.00	6.49	0.00	0.00
0.0 DEGREE AMPLITUDE	-5.70	-3.23	0.00	-.15	0.00	0.00
30.0 DEGREE AMPLITUDE	-2.09	-4.85	0.00	3.10	0.00	0.00
60.0 DEGREE AMPLITUDE	2.06	-5.18	0.00	5.54	0.00	0.00
90.0 DEGREE AMPLITUDE	5.67	-4.12	0.00	6.49	0.00	0.00
120.0 DEGREE AMPLITUDE	7.76	-1.95	0.00	5.70	0.00	0.00
150.0 DEGREE AMPLITUDE	7.77	.73	0.00	3.38	0.00	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-.1592	0.0000	-4.7995
30.0 DEGREE DISPLACEMENT	3.1086	0.0000	-.7432
60.0 DEGREE DISPLACEMENT	5.5436	0.0000	3.5121
90.0 DEGREE DISPLACEMENT	6.4931	0.0000	6.8265
120.0 DEGREE DISPLACEMENT	5.7029	0.0000	8.3117
150.0 DEGREE DISPLACEMENT	3.3845	0.0000	7.5698

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 10.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.04	4.89	.94	6.56	1.16	0.00
0.0 DEGREE AMPLITUDE	-4.33	4.12	.88	6.40	1.16	0.00
30.0 DEGREE AMPLITUDE	-7.14	2.25	.59	4.82	1.05	0.00
60.0 DEGREE AMPLITUDE	-8.03	-.21	.15	1.94	.66	0.00
90.0 DEGREE AMPLITUDE	-6.77	-2.62	-.33	-1.44	.09	0.00
120.0 DEGREE AMPLITUDE	-3.69	-4.33	-.72	-4.45	-.49	0.00
150.0 DEGREE AMPLITUDE	.36	-4.88	-.92	-6.26	-.95	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	6.4033	1.1641	-4.5848
30.0 DEGREE DISPLACEMENT	4.8226	1.0576	-7.3123
60.0 DEGREE DISPLACEMENT	1.9496	.6678	-8.0803
90.0 DEGREE DISPLACEMENT	-1.4456	.0990	-6.6833
120.0 DEGREE DISPLACEMENT	-4.4536	-.4962	-3.4955
150.0 DEGREE DISPLACEMENT	-6.2682	-.9585	.6289

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 20.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.04	4.05	1.62	4.10	1.60	0.00
0.0 DEGREE AMPLITUDE	3.06	3.97	1.54	4.07	1.58	0.00
30.0 DEGREE AMPLITUDE	-1.07	3.84	1.59	3.75	1.50	0.00
60.0 DEGREE AMPLITUDE	-4.91	2.68	1.20	2.43	1.02	0.00
90.0 DEGREE AMPLITUDE	-7.44	.79	.50	.45	.26	0.00
120.0 DEGREE AMPLITUDE	-7.97	-1.29	-.34	-1.64	-.56	0.00
150.0 DEGREE AMPLITUDE	-6.37	-3.04	-1.09	-3.30	-1.23	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	4.0761	1.5816	2.6279
30.0 DEGREE DISPLACEMENT	3.7571	1.5026	-1.5157
60.0 DEGREE DISPLACEMENT	2.4314	1.0209	-5.2533
90.0 DEGREE DISPLACEMENT	.4542	.2657	-7.5833
120.0 DEGREE DISPLACEMENT	-1.6446	-.5607	-7.8813
150.0 DEGREE DISPLACEMENT	-3.3029	-1.2369	-6.0675

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 30.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.05	3.35	2.49	2.82	2.80	0.00
0.0 DEGREE AMPLITUDE	7.74	1.80	.67	1.84	.86	0.00
30.0 DEGREE AMPLITUDE	5.61	2.97	1.78	2.66	2.08	0.00
60.0 DEGREE AMPLITUDE	1.97	3.34	2.42	2.77	2.73	0.00
90.0 DEGREE AMPLITUDE	-2.19	2.82	2.40	2.14	2.66	0.00
120.0 DEGREE AMPLITUDE	-5.77	1.54	1.74	.93	1.87	0.00
150.0 DEGREE AMPLITUDE	-7.80	-.15	.61	-.52	.58	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	1.8426	.8629	7.5583
30.0 DEGREE DISPLACEMENT	2.6680	2.0801	5.1118
60.0 DEGREE DISPLACEMENT	2.7784	2.7399	1.2956
90.0 DEGREE DISPLACEMENT	2.1444	2.6655	-2.8677
120.0 DEGREE DISPLACEMENT	.9357	1.8769	-6.2627
150.0 DEGREE DISPLACEMENT	-.5236	.5854	-7.9796

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO CASE 7
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

D = 40.0 (200000 DWT TANKER LOADED)

WD = 60.0

DISPL = 1397.4 M_1 = 83.7 M_2 = 83.7 M_3 = 1.0

TW = 12.0 H = 10.0

E = 0.0 X = -16.0 Y = 0.0 A = 519.55

TS_1 = 9.65 TS_2 = 10.85 TS_3 = 12.80 TS_4 = 13.7 TS_5 = 19.10 TS_6 = 1.0

E = 10.0 X = 0.0 Y = -16.0 A = 319.66

TS_1 = 9.65 TS_2 = 10.15 TS_3 = 8.35 TS_4 = 11.85 TS_5 = 5.30 TS_6 = 1.0

E = 20.0 X = 0.0 Y = -16.0 A = 209.77

TS_1 = 9.65 TS_2 = 9.0 TS_3 = 6.20 TS_4 = 9.0 TS_5 = 2.30 TS_6 = 1.0

E = 30.0 X = 0.0 Y = -16.0 A = 101.89

TS_1 = 9.65 TS_2 = 7.75 TS_3 = 7.15 TS_4 = 5.7 TS_5 = 3.55 TS_6 = 1.0

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 10.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.04	5.08	.72	6.64	.56	0.00
0.0 DEGREE AMPLITUDE	-4.33	4.48	.49	6.62	.29	0.00
30.0 DEGREE AMPLITUDE	-7.14	2.69	.17	5.95	.02	0.00
60.0 DEGREE AMPLITUDE	-8.03	.18	-.20	3.69	-.26	0.00
90.0 DEGREE AMPLITUDE	-6.77	-2.38	-.52	.43	-.47	0.00
120.0 DEGREE AMPLITUDE	-3.69	-4.30	-.70	-2.93	-.56	0.00
150.0 DEGREE AMPLITUDE	.36	-5.07	-.69	-5.52	-.49	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	6.6285	.2998	-4.4777
30.0 DEGREE DISPLACEMENT	5.9574	.0226	-7.1930
60.0 DEGREE DISPLACEMENT	3.6900	-.2606	-7.9810
90.0 DEGREE DISPLACEMENT	.4338	-.4740	-6.6304
120.0 DEGREE DISPLACEMENT	-2.9384	-.5604	-3.5032
150.0 DEGREE DISPLACEMENT	-5.5235	-.4967	.5626

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 0.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.04	5.45	0.00	4.97	0.00	0.00
0.0 DEGREE AMPLITUDE	-5.70	-2.69	0.00	-2.15	0.00	0.00
30.0 DEGREE AMPLITUDE	-2.09	-4.70	0.00	.37	0.00	0.00
60.0 DEGREE AMPLITUDE	2.06	-5.45	0.00	2.80	0.00	0.00
90.0 DEGREE AMPLITUDE	5.67	-4.73	0.00	4.48	0.00	0.00
120.0 DEGREE AMPLITUDE	7.76	-2.75	0.00	4.96	0.00	0.00
150.0 DEGREE AMPLITUDE	7.77	-.03	0.00	4.11	0.00	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-2.1599	0.0000	-4.9483
30.0 DEGREE DISPLACEMENT	.3719	0.0000	-.7857
60.0 DEGREE DISPLACEMENT	2.8041	0.0000	3.5874
90.0 DEGREE DISPLACEMENT	4.4860	0.0000	6.9992
120.0 DEGREE DISPLACEMENT	4.9641	0.0000	8.5357
150.0 DEGREE DISPLACEMENT	4.1130	0.0000	7.7850

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 30.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.05	3.31	1.79	2.74	1.35	0.00
0.0 DEGREE AMPLITUDE	7.74	1.81	1.05	1.81	.93	0.00
30.0 DEGREE AMPLITUDE	5.61	2.95	1.63	2.60	1.30	0.00
60.0 DEGREE AMPLITUDE	1.97	3.30	1.78	2.69	1.32	0.00
90.0 DEGREE AMPLITUDE	-2.19	2.77	1.44	2.06	.98	0.00
120.0 DEGREE AMPLITUDE	-5.77	1.49	.72	.88	.38	0.00
150.0 DEGREE AMPLITUDE	-7.80	-.18	-.19	-.53	-.32	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	1.8119	.9386	7.4527
30.0 DEGREE DISPLACEMENT	2.6017	1.3047	5.1542
60.0 DEGREE DISPLACEMENT	2.6943	1.3213	1.4747
90.0 DEGREE DISPLACEMENT	2.0650	.9838	-2.5999
120.0 DEGREE DISPLACEMENT	.8823	.3827	-5.9779
150.0 DEGREE DISPLACEMENT	-.5367	-.3209	-7.7541

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION. BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 20.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.04	4.22	1.10	4.59	.90	0.00
0.0 DEGREE AMPLITUDE	3.06	4.09	1.10	4.49	.89	0.00
30.0 DEGREE AMPLITUDE	-1.07	4.05	.94	4.35	.73	0.00
60.0 DEGREE AMPLITUDE	-4.91	2.92	.53	3.05	.36	0.00
90.0 DEGREE AMPLITUDE	-7.44	1.01	-.02	.92	-.09	0.00
120.0 DEGREE AMPLITUDE	-7.97	-1.16	-.57	-1.44	-.52	0.00
150.0 DEGREE AMPLITUDE	-6.37	-3.04	-.97	-3.43	-.82	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	4.4991	.8970	2.7512
30.0 DEGREE DISPLACEMENT	4.3590	.7314	-1.3359
60.0 DEGREE DISPLACEMENT	3.0509	.3699	-5.0652
90.0 DEGREE DISPLACEMENT	.9253	-.0907	-7.4372
120.0 DEGREE DISPLACEMENT	-1.4482	-.5271	-7.8165
150.0 DEGREE DISPLACEMENT	-3.4337	-.8222	-6.1012

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY | SHEET NO. CASE 10

SUBJECT

DRAWING NUMBER | COMPUTER | CHECKED BY | DATE

D = 40.0 (22,500 DWT TANKER LIGHT)

W.D. 150

DISP = 1350.7 M_1 = 81.3 M_2 = 84.3 M_3 = 1.0

TW = 10.0 H = 10.0

E = 0.0 X = -16.0 Y = 0.0 A = 389.6
T_{S1} = 9.8 T_{S2} = 9.7 T_{S3} = 10.80 T_{S4} = 16.2 T_{S5} = 21.7 T_{S6} = 1.0

E = 10.0 X = 0.0 Y = -16.0 A = 217.2
T_{S1} = 9.8 T_{S2} = 9.45 T_{S3} = 9.9 T_{S4} = 15.2 T_{S5} = 15.5 T_{S6} = 1.0

E = 20.0 X = 0.0 Y = -16.0 A = 144.8
T_{S1} = 9.8 T_{S2} = 8.95 T_{S3} = 9.25 T_{S4} = 13.1 T_{S5} = 12.6 T_{S6} = 1.0

E = 30.0 X = 0.0 Y = -16.0 A = 72.9
T_{S1} = 9.8 T_{S2} = 8.10 T_{S3} = 9.45 T_{S4} = 11.2 T_{S5} = 13.6 T_{S6} = 1.0

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 0.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW. -DEG-
MAXIMUM AMPLITUDE	8.01	7.91	0.00	1.67	0.00	0.00
0.0 DEGREE AMPLITUDE	-5.71	-4.69	0.00	-.88	0.00	0.00
30.0 DEGREE AMPLITUDE	-2.13	-7.24	0.00	-.05	0.00	0.00
60.0 DEGREE AMPLITUDE	2.01	-7.86	0.00	.79	0.00	0.00
90.0 DEGREE AMPLITUDE	5.62	-6.36	0.00	1.42	0.00	0.00
120.0 DEGREE AMPLITUDE	7.72	-3.16	0.00	1.67	0.00	0.00
150.0 DEGREE AMPLITUDE	7.75	.87	0.00	1.47	0.00	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-.8831	0.0000	-4.4005
30.0 DEGREE DISPLACEMENT	-.0511	0.0000	-.1105
60.0 DEGREE DISPLACEMENT	.7946	0.0000	4.2091
90.0 DEGREE DISPLACEMENT	1.4274	0.0000	7.4009
120.0 DEGREE DISPLACEMENT	1.6777	0.0000	8.6097
150.0 DEGREE DISPLACEMENT	1.4785	0.0000	7.5114

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 10.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.01	7.82	1.37	1.96	.32	0.00
0.0 DEGREE AMPLITUDE	-1.55	7.73	1.37	-.87	-.14	0.00
30.0 DEGREE AMPLITUDE	-5.27	6.14	1.20	-1.63	-.27	0.00
60.0 DEGREE AMPLITUDE	-7.58	2.89	.71	-1.96	-.32	0.00
90.0 DEGREE AMPLITUDE	-7.86	-1.12	.02	-1.76	-.29	0.00
120.0 DEGREE AMPLITUDE	-6.03	-4.84	-.66	-1.08	-.18	0.00
150.0 DEGREE AMPLITUDE	-2.58	-7.26	-1.17	-.12	-.02	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-.8735	-.1430	-1.9378
30.0 DEGREE DISPLACEMENT	-1.6370	-.2716	-5.6137
60.0 DEGREE DISPLACEMENT	-1.9619	-.3274	-7.7855
90.0 DEGREE DISPLACEMENT	-1.7610	-.2954	-7.8711
120.0 DEGREE DISPLACEMENT	-1.0883	-.1843	-5.8476
150.0 DEGREE DISPLACEMENT	-.1240	-.0238	-2.2573

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 20.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG
MAXIMUM AMPLITUDE	8.01	7.31	2.73	2.94	1.15	0.0
0.0 DEGREE AMPLITUDE	5.51	5.88	2.02	1.03	.36	0.0
30.0 DEGREE AMPLITUDE	1.86	7.27	2.66	-.48	-.22	0.0
60.0 DEGREE AMPLITUDE	-2.28	6.70	2.60	-1.87	-.76	0.0
90.0 DEGREE AMPLITUDE	-5.81	4.33	1.83	-2.75	-1.09	0.0
120.0 DEGREE AMPLITUDE	-7.79	.81	.58	-2.90	-1.13	0.0
150.0 DEGREE AMPLITUDE	-7.68	-2.93	-.83	-2.27	-.86	0.0

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	1.0373	.3694	4.9526
30.0 DEGREE DISPLACEMENT	-.4808	-.2284	1.1226
60.0 DEGREE DISPLACEMENT	-1.8702	-.7651	-3.0082
90.0 DEGREE DISPLACEMENT	-2.7585	-1.0968	-6.3330
120.0 DEGREE DISPLACEMENT	-2.9076	-1.1346	-7.9609
150.0 DEGREE DISPLACEMENT	-2.2776	-.8684	-7.4556

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 20.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.01	7.31	2.73	2.94	1.15	0.00
0.0 DEGREE AMPLITUDE	5.51	5.88	2.02	1.03	.36	0.00
30.0 DEGREE AMPLITUDE	1.86	7.27	2.66	-.48	-.22	0.00
60.0 DEGREE AMPLITUDE	-2.28	6.70	2.60	-1.87	-.76	0.00
90.0 DEGREE AMPLITUDE	-5.81	4.33	1.83	-2.75	-1.09	0.00
120.0 DEGREE AMPLITUDE	-7.79	.81	.58	-2.90	-1.13	0.00
150.0 DEGREE AMPLITUDE	-7.68	-2.93	-.83	-2.27	-.86	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	1.0373	.3694	4.9526
30.0 DEGREE DISPLACEMENT	-.4808	-.2284	1.1226
60.0 DEGREE DISPLACEMENT	-1.8702	-.7651	-3.0082
90.0 DEGREE DISPLACEMENT	-2.7585	-1.0968	-6.3330
120.0 DEGREE DISPLACEMENT	-2.9076	-1.1346	-7.9609
150.0 DEGREE DISPLACEMENT	-2.2776	-.8684	-7.4556

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 30.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.02	6.37	4.00	4.54	1.39	0.00
0.0 DEGREE AMPLITUDE	7.99	1.30	-.55	3.55	1.34	0.00
30.0 DEGREE AMPLITUDE	7.27	4.25	1.50	1.66	.98	0.00
60.0 DEGREE AMPLITUDE	4.60	6.05	3.16	-.67	.35	0.00
90.0 DEGREE AMPLITUDE	.69	6.24	3.97	-2.83	-.36	0.00
120.0 DEGREE AMPLITUDE	-3.39	4.75	3.71	-4.22	-.98	0.00
150.0 DEGREE AMPLITUDE	-6.57	1.98	2.46	-4.49	-1.34	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	3.5526	1.3431	8.1488
30.0 DEGREE DISPLACEMENT	1.6603	.9806	6.8514
60.0 DEGREE DISPLACEMENT	-.6769	.3554	3.7181
90.0 DEGREE DISPLACEMENT	-2.8328	-.3650	-.4114
120.0 DEGREE DISPLACEMENT	-4.2296	-.9876	-4.4307
150.0 DEGREE DISPLACEMENT	-4.4931	-1.3456	-7.2628

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 10.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.01	7.81	1.34	1.82	.93	0.00
0.0 DEGREE AMPLITUDE	-1.55	7.77	1.24	-.79	-.77	0.00
30.0 DEGREE AMPLITUDE	-5.27	6.31	.82	-1.51	-.93	0.00
60.0 DEGREE AMPLITUDE	-7.58	3.16	.18	-1.82	-.83	0.00
90.0 DEGREE AMPLITUDE	-7.86	-.83	-.50	-1.64	-.51	0.00
120.0 DEGREE AMPLITUDE	-6.03	-4.61	-1.05	-1.03	-.05	0.00
150.0 DEGREE AMPLITUDE	-2.58	-7.15	-1.32	-.13	.41	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-.7927	-.7795	-1.9015
30.0 DEGREE DISPLACEMENT	-1.5108	-.9326	-5.5083
60.0 DEGREE DISPLACEMENT	-1.8241	-.8359	-7.6390
90.0 DEGREE DISPLACEMENT	-1.6486	-.5152	-7.7229
120.0 DEGREE DISPLACEMENT	-1.0314	-.0564	-5.7374
150.0 DEGREE DISPLACEMENT	-.1378	.4174	-2.2146

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY | SHEET NO. CASE 9

SUBJECT

DRAWING NUMBER | COMPUTER | CHECKED BY | DATE

D = 40.0 (22,500 DWT TANKER LOADED)

W.D. = 150.0
DISPL = 1350.7 M_1 = 84.3 M_2 = 84.3 M_3 = 1.0

T_W = 10.0 H = 10.0

E = 0.0 X = -16.0 Y = 0.0 A = 389.6
TS_1 = 9.80 TS_2 = 10.00 TS_3 = 10.80 TS_4 = 17.1 TS_5 = 21.7 TS_6 = 1.0

E = 10.0 X = 0.0 Y = -16.0 A = 217.2
TS_1 = 9.80 TS_2 = 9.55 TS_3 = 8.75 TS_4 = 15.6 TS_5 = 11.1 TS_6 = 1.0

E = 20.0 X = 0.0 Y = -16.0 A = 149.8
TS_1 = 9.80 TS_2 = 9.20 TS_3 = 7.65 TS_4 = 13.35 TS_5 = 7.15 TS_6 = 1.0

E = 30.0 X = 0.0 Y = -16.0 A = 72.9
TS_1 = 9.80 TS_2 = 8.25 TS_3 = 7.35 TS_4 = 10.8 TS_5 = 8.3 TS_6 = 1.0

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 0.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.01	7.77	0.00	1.46	0.00	0.00
0.0 DEGREE AMPLITUDE	-5.71	-3.90	0.00	-.78	0.00	0.00
30.0 DEGREE AMPLITUDE	-2.13	-6.74	0.00	-.06	0.00	0.00
60.0 DEGREE AMPLITUDE	2.01	-7.77	0.00	.67	0.00	0.00
90.0 DEGREE AMPLITUDE	5.62	-6.72	0.00	1.23	0.00	0.00
120.0 DEGREE AMPLITUDE	7.72	-3.87	0.00	1.46	0.00	0.00
150.0 DEGREE AMPLITUDE	7.75	.01	0.00	1.29	0.00	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-.7852	0.0000	-4.6210
30.0 DEGREE DISPLACEMENT	-.0636	0.0000	-.2515
60.0 DEGREE DISPLACEMENT	.6750	0.0000	4.1852
90.0 DEGREE DISPLACEMENT	1.2328	0.0000	7.5006
120.0 DEGREE DISPLACEMENT	1.4602	0.0000	8.8063
150.0 DEGREE DISPLACEMENT	1.2964	0.0000	7.7522

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 20.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.01	7.42	2.27	2.77	1.54	0.00
0.0 DEGREE AMPLITUDE	5.51	5.57	2.18	1.04	1.53	0.00
30.0 DEGREE AMPLITUDE	1.86	7.27	2.21	-.38	1.44	0.00
60.0 DEGREE AMPLITUDE	-2.28	7.02	1.64	-1.70	.97	0.00
90.0 DEGREE AMPLITUDE	-5.81	4.89	.63	-2.57	.23	0.00
120.0 DEGREE AMPLITUDE	-7.79	1.45	-.54	-2.74	-.55	0.00
150.0 DEGREE AMPLITUDE	-7.68	-2.38	-1.57	-2.18	-1.20	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	1.0402	1.5301	4.9056
30.0 DEGREE DISPLACEMENT	-.3841	1.4439	1.2497
60.0 DEGREE DISPLACEMENT	-1.7056	.9709	-2.7410
90.0 DEGREE DISPLACEMENT	-2.5700	.2377	-5.9973
120.0 DEGREE DISPLACEMENT	-2.7458	-.5591	-7.6466
150.0 DEGREE DISPLACEMENT	-2.1858	-1.2062	-7.2470

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO. CASE 24
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

D = 40.0 (70,000 DWT TANKER LIGHT)

W.D = 150.0
DISPL = 1,350.7 M_1 = 84.3 M_2 = 84.3 M_3 = 1.0

Tw = 12.0 H = 10.0

E = 0.0 X = -16.0 Y = 0.0 A = 519.55
T_{S1} = 9.8 T_{S2} = 9.15 T_{S3} = 10.8 T_{S4} = 14.0 T_{S5} = 21.70 T_{S6} = 1.0

E = 10.0 X = 0.0 Y = -16.0 A = 319.66
T_{S1} = 9.8 T_{S2} = 8.8 T_{S3} = 9.45 T_{S4} = 12.6 T_{S5} = 13.55 T_{S6} = 1.0

E = 20.0 X = 0.0 Y = -16.0 A = 209.77
T_{S1} = 9.8 T_{S2} = 8.0 T_{S3} = 8.5 T_{S4} = 9.8 T_{S5} = 10.30 T_{S6} = 1.0

E = 30.0 X = 0.0 Y = -16.0 A = 104.89
T_{S1} = 9.8 T_{S2} = 7.3 T_{S3} = 8.8 T_{S4} = 7.4 T_{S5} = 11.20 T_{S6} = 1.0

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 10.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.08	4.30	.83	6.10	.89	0.00
0.0 DEGREE AMPLITUDE	-4.19	3.15	.66	-5.74	-.72	0.00
30.0 DEGREE AMPLITUDE	-7.09	1.27	.33	-6.00	-.88	0.00
60.0 DEGREE AMPLITUDE	-8.08	-.95	-.09	-4.66	-.81	0.00
90.0 DEGREE AMPLITUDE	-6.91	-2.92	-.49	-2.07	-.52	0.00
120.0 DEGREE AMPLITUDE	-3.88	-4.11	-.76	1.07	-.09	0.00
150.0 DEGREE AMPLITUDE	.17	-4.20	-.82	3.93	.36	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-5.7437	-.7210	-4.3859
30.0 DEGREE DISPLACEMENT	-6.0098	-.8856	-7.1864
60.0 DEGREE DISPLACEMENT	-4.6656	-.8130	-8.0612
90.0 DEGREE DISPLACEMENT	-2.0713	-.5224	-6.7760
120.0 DEGREE DISPLACEMENT	1.0780	-.0919	-3.6752
150.0 DEGREE DISPLACEMENT	3.9385	.3632	.4103

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 0.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.08	4.57	0.00	4.62	0.00	0.00
0.0 DEGREE AMPLITUDE	-5.86	-3.60	0.00	-2.26	0.00	0.00
30.0 DEGREE AMPLITUDE	-2.29	-4.53	0.00	.05	0.00	0.00
60.0 DEGREE AMPLITUDE	1.88	-4.24	0.00	2.35	0.00	0.00
90.0 DEGREE AMPLITUDE	5.56	-2.82	0.00	4.02	0.00	0.00
120.0 DEGREE AMPLITUDE	7.75	-.64	0.00	4.62	0.00	0.00
150.0 DEGREE AMPLITUDE	7.86	1.70	0.00	3.97	0.00	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-2.2669	0.0000	-4.8605
30.0 DEGREE DISPLACEMENT	.0503	0.0000	1.0301
60.0 DEGREE DISPLACEMENT	2.3540	0.0000	3.0762
90.0 DEGREE DISPLACEMENT	4.0270	0.0000	5.3583
120.0 DEGREE DISPLACEMENT	4.6209	0.0000	7.9367
150.0 DEGREE DISPLACEMENT	3.9767	0.0000	7.3885

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 20.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.09	3.70	1.44	5.23	2.06	0.00
0.0 DEGREE AMPLITUDE	3.25	3.68	1.42	4.91	1.83	0.00
30.0 DEGREE AMPLITUDE	-.88	3.39	1.35	5.16	2.06	0.00
60.0 DEGREE AMPLITUDE	-4.78	2.19	.92	4.02	1.74	0.00
90.0 DEGREE AMPLITUDE	-7.40	.41	.24	1.81	.95	0.00
120.0 DEGREE AMPLITUDE	-8.04	-1.48	-.50	-.88	-.09	0.00
150.0 DEGREE AMPLITUDE	-6.52	-2.98	-1.11	-3.35	-1.11	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	4.9150	1.8335	2.8558
30.0 DEGREE DISPLACEMENT	5.1624	2.0641	-1.2656
60.0 DEGREE DISPLACEMENT	4.0266	1.7416	-5.0480
90.0 DEGREE DISPLACEMENT	1.8119	.9525	-7.4778
120.0 DEGREE DISPLACEMENT	-.8883	-.0918	-7.9039
150.0 DEGREE DISPLACEMENT	-3.3505	-1.1116	-6.2121

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 30.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.09	3.13	2.20	3.30	3.34	0.00
0.0 DEGREE AMPLITUDE	7.83	1.81	.96	1.96	-.36	0.00
30.0 DEGREE AMPLITUDE	5.77	2.85	1.82	3.03	1.34	0.00
60.0 DEGREE AMPLITUDE	2.16	3.12	2.19	3.28	2.69	0.00
90.0 DEGREE AMPLITUDE	-2.02	2.55	1.97	2.66	3.32	0.00
120.0 DEGREE AMPLITUDE	-5.67	1.30	1.23	1.32	3.05	0.00
150.0 DEGREE AMPLITUDE	-7.80	-.29	.15	-.37	1.97	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	1.9648	-.3602	7.5702
30.0 DEGREE DISPLACEMENT	3.0319	1.3493	5.2686
60.0 DEGREE DISPLACEMENT	3.2866	2.6974	1.5553
90.0 DEGREE DISPLACEMENT	2.6606	3.3227	-2.5746
120.0 DEGREE DISPLACEMENT	1.3217	3.0576	-6.0148
150.0 DEGREE DISPLACEMENT	-.3713	1.9733	-7.3433

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 501B

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO CASE 13
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

D. 40.0 (70,000 DWT TANKER LOADED)

W.D. 150
DISPL. = 1,350.7 M_1 = 84.3 M_2 = 84.3 M_3 = 1.0

T_W = 12.0 H = 10.0

E = 0.0 X = -16.0 Y = 0.0 A = 519.55
T_{S1} = 9.8 T_{S2} = 9.5 T_{S3} = 10.8 T_{S4} = 15.5 T_{S5} = 21.7 T_{S6} = 1.0

E = 10.0 X = 0.0 Y = -16.0 A = 319.66
T_{S1} = 9.8 T_{S2} = 9.0 T_{S3} = 7.7 T_{S4} = 13.5 T_{S5} = 7.25 T_{S6} = 1.0

E = 20.0 X = 0.0 Y = -16.0 A = 209.77
T_{S1} = 9.8 T_{S2} = 8.15 T_{S3} = 6.4 T_{S4} = 10.5 T_{S5} = 3.5 T_{S6} = 1.0

E = 30.0 X = 0.0 Y = -16.0 A = 104.89
T_{S1} = 9.8 T_{S2} = 7.2 T_{S3} = 6.75 T_{S4} = 7.0 T_{S5} = 4.3 T_{S6} = 1.0

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 0.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.08	4.78	0.00	3.29	0.00	0.00
0.0 DEGREE AMPLITUDE	-5.86	-3.57	0.00	-2.18	0.00	0.00
30.0 DEGREE AMPLITUDE	-2.29	-4.68	0.00	-.66	0.00	0.00
60.0 DEGREE AMPLITUDE	1.88	-4.54	0.00	1.03	0.00	0.00
90.0 DEGREE AMPLITUDE	5.56	-3.18	0.00	2.46	0.00	0.00
120.0 DEGREE AMPLITUDE	7.75	-.97	0.00	3.22	0.00	0.00
150.0 DEGREE AMPLITUDE	7.86	1.50	0.00	3.12	0.00	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-2.1872	0.0000	-4.8688
30.0 DEGREE DISPLACEMENT	-.6638	0.0000	-.9868
60.0 DEGREE DISPLACEMENT	1.0374	0.0000	3.1596
90.0 DEGREE DISPLACEMENT	2.4607	0.0000	6.4594
120.0 DEGREE DISPLACEMENT	3.2246	0.0000	8.0284
150.0 DEGREE DISPLACEMENT	3.1245	0.0000	7.4462

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION. BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 10.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.08	4.42	.66	5.10	.64	0.00
0.0 DEGREE AMPLITUDE	-4.19	3.33	.42	-4.17	.38	0.00
30.0 DEGREE AMPLITUDE	-7.09	1.43	.11	-5.08	.06	0.00
60.0 DEGREE AMPLITUDE	-8.08	-.84	-.23	-4.63	-.26	0.00
90.0 DEGREE AMPLITUDE	-6.91	-2.90	-.51	-2.94	-.52	0.00
120.0 DEGREE AMPLITUDE	-3.88	-4.16	-.65	-.46	-.64	0.00
150.0 DEGREE AMPLITUDE	.17	-4.34	-.62	2.14	-.59	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-4.1722	.3833	-4.3178
30.0 DEGREE DISPLACEMENT	-5.0860	.0695	-7.1252
60.0 DEGREE DISPLACEMENT	-4.6371	-.2627	-8.0235
90.0 DEGREE DISPLACEMENT	-2.9456	-.5247	-6.7719
120.0 DEGREE DISPLACEMENT	-.4649	-.6460	-3.7057
150.0 DEGREE DISPLACEMENT	2.1404	-.5943	.3533

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 30.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.09	3.10	1.71	3.14	1.41	0.00
0.0 DEGREE AMPLITUDE	7.83	1.81	1.04	1.93	.96	0.00
30.0 DEGREE AMPLITUDE	5.77	2.83	1.58	2.91	1.35	0.00
60.0 DEGREE AMPLITUDE	2.16	3.08	1.69	3.11	1.37	0.00
90.0 DEGREE AMPLITUDE	-2.02	2.51	1.35	2.47	1.03	0.00
120.0 DEGREE AMPLITUDE	-5.67	1.26	.65	1.17	.41	0.00
150.0 DEGREE AMPLITUDE	-7.80	-.31	-.22	-.43	-.32	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	1.9329	.9665	7.5475
30.0 DEGREE DISPLACEMENT	2.9132	1.3533	5.3357
60.0 DEGREE DISPLACEMENT	3.1129	1.3774	1.6943
90.0 DEGREE DISPLACEMENT	2.4785	1.0324	-2.4011
120.0 DEGREE DISPLACEMENT	1.1799	.4108	-5.8532
150.0 DEGREE DISPLACEMENT	-.4347	-.3208	-7.7369

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 30.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.02	6.25	3.48	5.02	2.85	0.00
0.0 DEGREE AMPLITUDE	7.99	1.53	1.10	3.47	.76	0.00
30.0 DEGREE AMPLITUDE	7.27	4.35	2.61	1.18	2.03	0.00
60.0 DEGREE AMPLITUDE	4.60	6.01	3.41	-1.41	2.76	0.00
90.0 DEGREE AMPLITUDE	.69	6.06	3.30	-3.63	2.75	0.00
120.0 DEGREE AMPLITUDE	-3.39	4.48	2.31	-4.88	2.00	0.00
150.0 DEGREE AMPLITUDE	-6.57	1.70	.69	-4.82	.71	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	3.4714	.7648	7.6854
30.0 DEGREE DISPLACEMENT	1.1885	2.0384	6.5425
60.0 DEGREE DISPLACEMENT	-1.4129	2.7658	3.6465
90.0 DEGREE DISPLACEMENT	-3.6358	2.7521	-.2264
120.0 DEGREE DISPLACEMENT	-4.8844	2.0010	-4.0388
150.0 DEGREE DISPLACEMENT	-4.8242	.7137	-6.7690

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 20.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.09	3.77	1.13	5.84	.92	0.00
0.0 DEGREE AMPLITUDE	3.25	3.74	1.13	5.01	.91	0.00
30.0 DEGREE AMPLITUDE	-.88	3.48	.97	5.84	.75	0.00
60.0 DEGREE AMPLITUDE	-4.78	2.29	.55	5.09	.38	0.00
90.0 DEGREE AMPLITUDE	-7.40	.48	-.01	2.99	-.08	0.00
120.0 DEGREE AMPLITUDE	-8.04	-1.45	-.57	.07	-.53	0.00
150.0 DEGREE AMPLITUDE	-6.52	-3.00	-.98	-2.85	-.83	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	5.0195	.9186	2.9385
30.0 DEGREE DISPLACEMENT	5.8422	.7512	-1.1580
60.0 DEGREE DISPLACEMENT	5.0995	.3826	-4.9442
90.0 DEGREE DISPLACEMENT	2.9903	-.0885	-7.4057
120.0 DEGREE DISPLACEMENT	.0799	-.5360	-7.8828
150.0 DEGREE DISPLACEMENT	-2.8519	-.8398	-6.2477

ENGINEERING DEPARTMENT COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
RELATIVE MOTION BETWEEN BUOY & SHIP FOR 0° HEADING			
DRAWING NUMBER	COMPUTER NdB	CHECKED BY	DATE 4-7-66

22,500 DWT TANKER LIGHT 60' WD $X = 0°$ $T_W = 10$ SEC

AMPLITUDE $= \sqrt{(100 + X_{SHIP} - X_{BUOY})^2 + (Z_{SHIP} - Z_{BUOY})^2} - 100.00$

0°	$\sqrt{(100 - 0.88 + 1.12)^2 + (17.42 + 5.89)^2} - 100.00 = \sqrt{100.24^2 + 23.31^2} - 100$	$= +2.91$
30°	$\sqrt{(100 - 1.20 - 0.08)^2 + (12.02 + 3.09)^2} - 100.00 = \sqrt{98.72^2 + 15.11^2} - 100$	$= -0.13$
60°	$\sqrt{(100 - 1.20 - 1.27)^2 + (3.39 - 0.53)^2} - 100.00 = \sqrt{97.53^2 + 2.86^2} - 100$	$= -2.93$
90°	$\sqrt{(100 - 0.88 - 2.11)^2 + (-6.13 - 4.02)^2} - 100.00 = \sqrt{97.01^2 + (-10.15)^2} - 100$	$= -2.46$
120°	$\sqrt{(100 - 0.32 - 2.39)^2 + (-14.02 - 6.42)^2} - 100.00 = \sqrt{97.29^2 + (-20.44)^2} - 100$	$= -0.59$
150°	$\sqrt{(100 + 0.32 - 2.03)^2 + (-18.16 - 7.11)^2} - 100.00 = \sqrt{98.29^2 + (-25.27)^2} - 100$	$= +1.49$
180°	$\sqrt{(100 + 0.88 - 1.12)^2 + (-17.42 - 5.89)^2} - 100.00 = \sqrt{99.76^2 + (-23.31)^2} - 100$	$= +2.45$
210°	$\sqrt{(100 + 1.20 + 0.08)^2 + (-12.02 - 3.09)^2} - 100.00 = \sqrt{101.28^2 + (-15.11)^2} - 100$	$= +2.90$
240°	$\sqrt{(100 + 1.20 + 1.27)^2 + (-3.39 + 0.53)^2} - 100.00 = \sqrt{102.47^2 + (-2.86)^2} - 100$	$= +2.51$
270°	$\sqrt{(100 + 0.88 + 2.11)^2 + (6.13 + 4.02)^2} - 100.00 = \sqrt{102.99^2 + 10.15^2} - 100$	$= +3.99$
300°	$\sqrt{(100 + 0.32 + 2.39)^2 + (14.02 + 6.42)^2} - 100.00 = \sqrt{102.71^2 + 20.44^2} - 100$	$= +4.72$
330°	$\sqrt{(100 - 0.32 + 2.03)^2 + (18.16 + 7.11)^2} - 100.00 = \sqrt{101.71^2 + 25.27^2} - 100$	$= +4.80$

MAX AMPLITUDE $Z = (4.80 + 2.46)/2 = 3.63'$

ACCELERATION $a = \left(\frac{2\pi}{T_W}\right)^2 \times Z = 0.628^2 \times 3.63 = 1.43\ FT/SEC^2$

WAVE FORCE MOORING LOAD $= a \times M = 1.43 \times 83.7 = 119.7^K$

WIND & CURRENT MOORING LOAD $= 28.0^K$

DESIGN LOAD FOR MOORING CONNECTION = W.F. MOORING LOAD + W/C MOORING LOAD =
$= 119.7 + 28.0 = \underline{147.7^K}$

DESIGN LOAD FOR SPACER = W.F MOORING LOAD − W/C. MOORING LOAD =
$= 119.7 - 28.0 = \underline{91.7^K}$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER NDB	CHECKED BY	DATE 4-7-66

22,500 DWT TANKER LOADED 60' WD $\chi = 0°$ $T_W = 10$ SEC

$0°$ $\sqrt{(100 - 0.89 + 1.00)^2 + (17.66 + 5.74)^2} - 100 = \sqrt{100.11^2 + 23.40^2} - 100 = +2.81$

$30°$ $\sqrt{(100 - 1.22 + 0.01)^2 + (17.59 + 2.92)^2} - 100 = \sqrt{98.79^2 + 15.46^2} - 100 = -0.01$

$60°$ $\sqrt{(100 - 1.22 - 0.98)^2 + (4.05 - 0.69)^2} - 100 = \sqrt{97.80^2 + 3.36^2} - 100 = -2.14$

$90°$ $\sqrt{(100 - 0.89 - 1.71)^2 + (-5.51 - 4.11)^2} - 100 = \sqrt{97.40^2 + 9.62^2} - 100 = -2.13$

$120°$ $\sqrt{(100 - 0.32 - 1.99)^2 + (-13.61 - 6.43)^2} - 100 = \sqrt{97.69^2 + 20.04^2} - 100 = -0.28$

$150°$ $\sqrt{(100 + 0.32 - 1.73)^2 + (-18.05 - 7.03)^2} - 100 = \sqrt{98.59^2 + 25.08^2} - 100 = +1.73$

$180°$ $\sqrt{(100 + 0.89 - 1.00)^2 + (-17.66 - 5.74)^2} - 100 = \sqrt{99.89^2 + 23.40^2} - 100 = +2.59$

$210°$ $\sqrt{(100 + 1.22 - 0.01)^2 + (-15.59 - 2.92)^2} - 100 = \sqrt{100.21^2 + 15.46^2} - 100 = +1.40$

$240°$ $\sqrt{(100 + 1.22 + 0.98)^2 + (-4.05 + 0.69)^2} - 100 = \sqrt{102.20^2 + 3.36^2} - 100 = +2.26$

$270°$ $\sqrt{(100 + 0.89 + 1.71)^2 + (5.51 + 4.11)^2} - 100 = \sqrt{102.60^2 + 9.62^2} - 100 = +3.05$

$300°$ $\sqrt{(100 + 0.32 + 1.99)^2 + (13.61 + 6.43)^2} - 100 = \sqrt{102.31^2 + 20.04^2} - 100 = +4.25$

$330°$ $\sqrt{(100 - 0.32 + 1.73)^2 + (18.05 + 7.03)^2} - 100 = \sqrt{101.41^2 + 25.08^2} - 100 = +4.47$

MAX AMPLITUDE $Z = 1.47 + 2.14 = 3.31$ FT

ACCELERATION $a = 0.628^2 \times 3.31 = 1.29$ FT/SEC^2

WAVE FORCE MOORING LOAD $= a \times M = 1.29 \times 83.7 = 108.0$ K

WIND & CURRENT MOORING LOAD $= 20.5$

DESIGN LOAD FOR MOORING CONNECTION $= 108.0 + 20.5 = \underline{128.5}$ K

DESIGN LOAD FOR SPACER $= 108.0 - 20.5 = \underline{87.5}$ K

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER NdB	CHECKED BY	DATE 4-7-66

70,000 DWT TANKER LIGHT 60'WD $\chi = 0°$ $T_W = 12$ SEC

0° $\sqrt{(100 - 0.84 + 0.16)^2 + (15.67 + 4.80)^2} - 100 = \sqrt{99.32^2 + 20.47^2} - 100 = +1.39$

30° $\sqrt{(100 - 1.16 - 3.11)^2 + (11.14 + 0.74)^2} - 100 = \sqrt{95.73^2 + 11.88^2} - 100 = -3.54$

60° $\sqrt{(100 - 1.16 - 5.54)^2 + (3.62 - 3.51)^2} - 100 = \sqrt{93.30^2 + 0.11^2} - 100 = -6.70$

90° $\sqrt{(100 - 0.84 - 6.49)^2 + (-4.86 - 6.83)^2} - 100 = \sqrt{92.67^2 + 11.69^2} - 100 = -6.60$

120° $\sqrt{(100 - 0.31 - 5.70)^2 + (-12.05 - 8.31)^2} - 100 = \sqrt{93.99^2 + 20.36^2} - 100 = -3.83$

150° $\sqrt{(100 + 0.31 - 3.38)^2 + (-16.01 - 7.57)^2} - 100 = \sqrt{96.73^2 + 23.58^2} - 100 = -0.24$

180° $\sqrt{(100 + 0.84 - 0.16)^2 + (-15.67 - 4.80)^2} - 100 = \sqrt{100.68^2 + 20.47^2} - 100 = +2.74$

210° $\sqrt{(100 + 1.16 + 3.11)^2 + (-11.14 - 0.74)^2} - 100 = \sqrt{109.27^2 + 11.88^2} - 100 = +4.94$

240° $\sqrt{(100 + 1.16 + 5.54)^2 + (-3.62 + 3.51)^2} - 100 = \sqrt{106.70^2 + 0.11^2} - 100 = +6.70$

270° $\sqrt{(100 + 0.84 + 6.49)^2 + (-4.86 + 6.83)^2} - 100 = \sqrt{107.33^2 + 11.69^2} - 100 = +7.96$

300° $\sqrt{(100 + 0.31 + 5.70)^2 + (12.05 + 8.31)^2} - 100 = \sqrt{106.01^2 + 20.36^2} - 100 = +7.95$

330° $\sqrt{(100 - 0.31 + 3.38)^2 + (16.01 + 7.57)^2} - 100 = \sqrt{103.07^2 + 23.58^2} - 100 = +5.37$

MAX AMPLITUDE $Z = \frac{6.70 + 7.96}{2} = 7.33'$

ACCELERATION $a = \left(\frac{2\pi}{12}\right)^2 \times 7.33 = 2.01$ FT/SEC^2

WAVE FORCE MOORING LOAD $= a \times M = 2.01 \times 83.7 = 168.2^K$

WIND & CURRENT MOORING LOAD $= 53.6^K$

DESIGN LOAD FOR MOORING CONNECTION $= 168.2 + 53.6 = \underline{221.8^K}$

DESIGN LOAD FOR SPACER $= 168.2 - 53.6 = \underline{114.6^K}$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO.
SUBJECT			
DRAWING NUMBER	COMPUTER NdB	CHECKED BY	DATE 4-11-66

70,000 DWT TANKER LOADED 60'WD $\lambda = 0°$ $T_W = 12$ SEC

0°	$\sqrt{(100 - 0.85 + 2.16)^2 + (15.20 + 4.95)^2} - 100$	$\sqrt{101.31^2 + 20.85^2} - 100$	$+ 3.43$
30°	$\sqrt{(100 - 1.17 - 0.37)^2 + (11.63 + 0.72)^2} - 100$	$\sqrt{98.46^2 + 12.42^2} - 100$	$- 0.76$
60°	$\sqrt{(100 - 1.17 - 2.80)^2 + (4.24 - 3.52)^2} - 100$	$\sqrt{96.03^2 + 0.65^2} - 100$	$- 3.97$
90°	$\sqrt{(100 - 0.85 - 9.49)^2 + (-4.28 - 7.00)^2} - 100$	$\sqrt{89.66^2 + 11.28^2} - 100$	$- 4.67$
120°	$\sqrt{(100 - 0.31 - 9.96)^2 + (-11.65 - 8.54)^2} - 100$	$\sqrt{89.73^2 + 20.19^2} - 100$	$- 3.14$
150°	$\sqrt{(100 + 0.31 - 9.11)^2 + (-15.91 - 7.79)^2} - 100$	$\sqrt{96.20^2 + 23.70^2} - 100$	$- 0.92$
180°	$\sqrt{(100 + 0.85 - 2.16)^2 + (-15.20 - 4.95)^2} - 100$	$\sqrt{98.69^2 + 20.85^2} - 100$	$+ 0.87$
210°	$\sqrt{(100 + 1.17 + 0.37)^2 + (+11.63 - 0.72)^2} - 100$	$\sqrt{101.54^2 + 12.42^2} - 100$	$+ 2.30$
240°	$\sqrt{(100 + 1.17 + 2.80)^2 + (-4.24 + 3.52)^2} - 100$	$\sqrt{103.97^2 + 0.65^2} - 100$	$+ 3.97$
270°	$\sqrt{(100 + 0.85 + 9.49)^2 + (4.28 + 7.00)^2} - 100$	$\sqrt{105.34^2 + 11.28^2} - 100$	$+ 5.99$
300°	$\sqrt{(100 + 0.31 + 9.96)^2 + (11.65 + 8.54)^2} - 100$	$\sqrt{105.27^2 + 20.19^2} - 100$	$+ 7.19$
330°	$\sqrt{(100 - 0.31 + 9.11)^2 + (15.91 + 7.79)^2} - 100$	$\sqrt{103.80^2 + 23.70^2} - 100$	$+ 6.47$

MAX AMPLITUDE $Z = 7.19 + 4.67 = 5.93'$

ACCELERATION $a = \left(\frac{2\pi}{12}\right)^2 \times 5.93^2 = 1.62$ FT/SEC^2

WAVE FORCE MOORING LOAD $= a \times M = 1.62 \times 83.7 = 135.6^K$

WIND & CURRENT MOORING LOAD $= 35.2^K$

DESIGN LOAD FOR MOORING CONNECTION $= 135.6 + 35.2 = \underline{170.8^K}$

DESIGN LOAD FOR SPACER $= 135.6 - 35.2 = \underline{100.4^K}$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO.
SUBJECT			
DRAWING NUMBER	COMPUTER NdB	CHECKED BY	DATE 4-11-66

22,500 DWT TANKER LOADED 150' W.D. $\chi = 0°$ $T_W = 10$ SEC

$0° \quad \sqrt{(100 - 0.89 + 0.79)^2 + (17.66 + 4.62)^2} - 100 = \sqrt{99.90^2 + 22.28^2} - 100 = +2.35$

$30° \quad \sqrt{(100 - 1.22 + 0.06)^2 + (12.54 + 0.25)^2} - 100 = \sqrt{98.84^2 + 12.79^2} - 100 = -0.34$

$60° \quad \sqrt{(100 - 1.22 - 0.68)^2 + (4.05 - 4.19)^2} - 100 = \sqrt{98.10^2 + 0.14^2} - 100 = -1.90$

$90° \quad \sqrt{(100 - 0.89 - 1.23)^2 + (-5.51 - 7.50)^2} - 100 = \sqrt{97.88^2 + 13.01^2} - 100 = -1.26$

$120° \quad \sqrt{(100 - 0.32 - 1.46)^2 + (-13.61 - 8.81)^2} - 100 = \sqrt{98.22^2 + 22.42^2} - 100 = +0.75$

$150° \quad \sqrt{(100 + 0.32 - 1.30)^2 + (-18.05 - 7.75)^2} - 100 = \sqrt{99.02^2 + 25.80^2} - 100 = +2.33$

$180° \quad \sqrt{(100 + 0.89 - 0.79)^2 + (-17.66 - 4.62)^2} - 100 = \sqrt{101.10^2 + 22.28^2} - 100 = +2.55$

$210° \quad \sqrt{(100 + 1.22 - 0.06)^2 + (-12.54 - 0.25)^2} - 100 = \sqrt{101.16^2 + 12.79^2} - 100 = +1.97$

$240° \quad \sqrt{(100 + 1.22 - 0.68)^2 + (-4.05 + 4.19)^2} - 100 = \sqrt{100.54^2 + 0.14^2} - 100 = +0.54$

$270° \quad \sqrt{(100 + 0.89 + 1.23)^2 + (5.51 + 7.50)^2} - 100 = \sqrt{102.12^2 + 13.01^2} - 100 = +2.95$

$300° \quad \sqrt{(100 + 0.32 + 1.46)^2 + (13.61 + 8.81)^2} - 100 = \sqrt{101.78^2 + 22.42^2} - 100 = +4.22$

$330° \quad \sqrt{(100 - 0.32 + 1.30)^2 + (18.05 + 7.75)^2} - 100 = \sqrt{100.98^2 + 25.80^2} - 100 = +4.22$

MAX AMPLITUDE = $\frac{4.22 + 1.90}{2} = 3.06'$

ACCELERATION = $\left(\frac{2\pi}{10}\right)^2 \times 3.06 = 1.21$ '/SEC^2

WAVE FORCE MOORING LOAD = $Ma = 1.21 \times 84.3 = 102.0^k$

WIND & CURRENT MOORING LOAD = 20.5^k

DESIGN LOAD FOR MOORING CONNECTION = $102 + 20.5 = \underline{\underline{122.5^k}}$

DESIGN LOAD FOR SPACER = $102.0 - 20.5 = \underline{\underline{81.5^k}}$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER NdB	CHECKED BY	DATE 4-11-66

22,500 DWT TANKER LIGHT 150' WD $X = 0°$ $T_W = 10$ SEC

$0°$ $\sqrt{(100 - 0.89 + 0.88)^2 + (17.66 + 4.40)^2} - 100 = \sqrt{99.99^2 + 22.06^2} - 100 = +2.39$

$30°$ $\sqrt{(100 - 1.22 + 0.05)^2 + (12.54 + 0.11)^2} - 100 = \sqrt{98.83^2 + 12.65^2} - 100 = -0.36$

$60°$ $\sqrt{(100 - 1.22 - 0.79)^2 + (4.05 - 4.21)^2} - 100 = \sqrt{97.99^2 + 0.16^2} - 100 = -2.01$

$90°$ $\sqrt{(100 - 0.89 - 1.43)^2 + (-5.51 - 7.40)^2} - 100 = \sqrt{97.68^2 + 12.91^2} - 100 = -1.47$

$120°$ $\sqrt{(100 - 0.32 - 1.68)^2 + (-13.61 - 8.61)^2} - 100 = \sqrt{98.00^2 + 22.22^2} - 100 = +0.49$

$150°$ $\sqrt{(100 + 0.32 - 1.48)^2 + (-18.05 - 7.51)^2} - 100 = \sqrt{98.84^2 + 25.56^2} - 100 = +2.09$

$180°$ $\sqrt{(100 + 0.89 - 0.88)^2 + (-17.66 - 4.40)^2} - 100 = \sqrt{100.01^2 + 22.06^2} - 100 = +2.41$

$210°$ $\sqrt{(100 + 1.22 + 0.05)^2 + (-12.54 - 0.11)^2} - 100 = \sqrt{101.27^2 + 12.65^2} - 100 = +2.06$

$240°$ $\sqrt{(100 + 1.22 + 0.79)^2 + (-4.05 + 4.21)^2} - 100 = \sqrt{102.01^2 + 0.16^2} - 100 = +2.01$

$270°$ $\sqrt{(100 + 0.89 + 1.43)^2 + (5.51 + 7.40)^2} - 100 = \sqrt{102.32^2 + 12.91^2} - 100 = +3.13$

$300°$ $\sqrt{(100 + 0.32 + 1.68)^2 + (13.61 + 8.61)^2} - 100 = \sqrt{102.00^2 + 22.22^2} - 100 = +4.39$

$330°$ $\sqrt{(100 - 0.32 + 1.48)^2 + (18.05 + 7.51)^2} - 100 = \sqrt{101.16^2 + 25.56^2} - 100 = +4.34$

MAX AMPLITUDE $= \frac{2.01 + 4.39}{2} = 3.20'$

ACCELERATION $a = \left(\frac{2\pi}{T_W}\right)^2 \times 3.20 = 1.26$ '/SEC^2

WAVE FORCE MOORING LOAD $= a \times M = 1.26 \times 84.3 = 106.2^K$

WIND & CURRENT MOORING LOAD $= 28.0^K$

DESIGN LOAD FOR MOORING CONNECTION $= 106.2 + 28.0 = \underline{134.2^K}$

DESIGN LOAD FOR SPACER $= 106.2 - 28.0 = \underline{78.2^K}$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER N dB	CHECKED BY	DATE 4-11-66

70,000 DWT TANKER LOADED 150' W.D $\chi = 0°$ $T_W = 12$ SEC

0° $\sqrt{(100 - 0.85 + 2.19)^2 + (15.90 + 4.81)^2} - 100 = \sqrt{101.34^2 + 20.71^2} - 100 = +3.45$

30° $\sqrt{(100 - 1.17 + 0.66)^2 + (11.63 + 0.99)^2} - 100 = \sqrt{99.49^2 + 12.62^2} - 100 = +0.29$

60° $\sqrt{(100 - 1.17 - 1.04)^2 + (4.24 - 3.16)^2} - 100 = \sqrt{97.79^2 + 1.08^2} - 100 = -2.20$

90° $\sqrt{(100 - 0.85 - 2.46)^2 + (-9.28 - 6.46)^2} - 100 = \sqrt{96.69^2 + 10.74^2} - 100 = -2.72$

120° $\sqrt{(100 - 0.31 - 3.22)^2 + (-11.65 - 8.03)^2} - 100 = \sqrt{96.47^2 + 19.68^2} - 100 = -1.54$

150° $\sqrt{(100 + 0.31 - 3.12)^2 + (-15.91 - 7.45)^2} - 100 = \sqrt{97.19^2 + 23.36^2} - 100 = -0.04$

180° $\sqrt{(100 + 0.85 - 2.19)^2 + (-15.90 - 4.87)^2} - 100 = \sqrt{98.66^2 + 20.77^2} - 100 = +0.82$

210° $\sqrt{(100 + 1.17 - 0.66)^2 + (-11.63 - 0.99)^2} - 100 = \sqrt{100.51^2 + 12.62^2} - 100 = +1.30$

240° $\sqrt{(100 + 1.17 + 1.04)^2 + (-4.24 + 3.16)^2} - 100 = \sqrt{102.21^2 + 1.08^2} - 100 = +2.22$

270° $\sqrt{(100 + 0.85 + 2.46)^2 + (4.28 + 6.46)^2} - 100 = \sqrt{103.31^2 + 10.74^2} - 100 = +3.87$

300° $\sqrt{(100 + 0.31 + 3.22)^2 + (11.65 + 8.03)^2} - 100 = \sqrt{103.53^2 + 19.68^2} - 100 = +5.38$

330° $\sqrt{(100 - 0.31 + 3.12)^2 + (15.91 + 7.45)^2} - 100 = \sqrt{102.81^2 + 23.36^2} - 100 = +5.43$

MAX AMPLITUDE $= \frac{2.72 + 5.43}{2} = 4.08'$

ACCELERATION $= \left(\frac{2\pi}{12}\right)^2 \times 4.08 = 1.12'/SEC^2$

WAVE FORCE MOORING LOAD $= 1.12 \times 84.3 = 94.4^K$

WIND & CURRENT MOORING LOAD $= 35.2^K$

DESIGN LOAD FOR MOORING CONNECTION $= 94.4 + 35.2 = \underline{129.6^K}$

DESIGN LOAD FOR SPACER $= 94.4 - 35.2 = \underline{59.2^K}$

SECTION II

REVISED CALCULATIONS

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO

SUBJECT: MOORING LINE DESIGN

DRAWING NUMBER	COMPUTER	CHECKED BY	DATE
	NdB		4-7-66

TANKER SIZE	DRAFT	W.D.	MOORING LOAD	SPACER LOAD
22,500 DWT	LIGHT	60'	147.7 K	91.7 K
22,500 DWT	LOADED	60'	128.5 K	87.5 K
70,000 DWT	LIGHT	60'	221.8 K	119.6 K
70,000 DWT	LOADED	60'	170.8 K	100.4 K
22,500 DWT	LIGHT	150'	122.5 K	81.5 K
22,500 DWT	LOADED	150'	139.2 K	78.2 K
70,000 DWT	LIGHT	150'	180.9 K	73.7 K
70,000 DWT	LOADED	150'	129.6 K	59.2 K

MAX MOORING LOAD 221.8 K
ADD 35% FOR IMPACT DUE TO SLACK LINES
DESIGN LOAD FOR MOORING LINES = 1.35 x 221.8 = 300 K

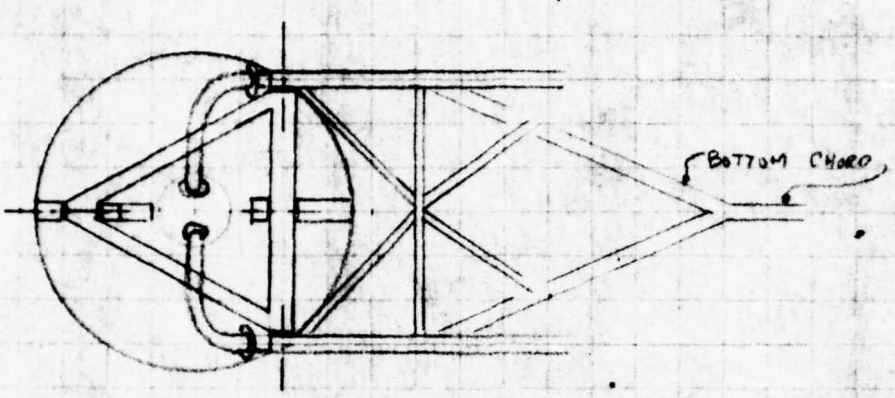
MAX SPACER LOAD = 119.6 K
ADD 35% FOR IMPACT DUE TO SLACK LINES
DESIGN LOAD FOR SPACER = 1.35 x 119.6 = 155 K

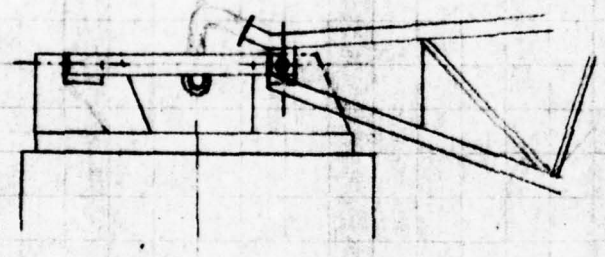
ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

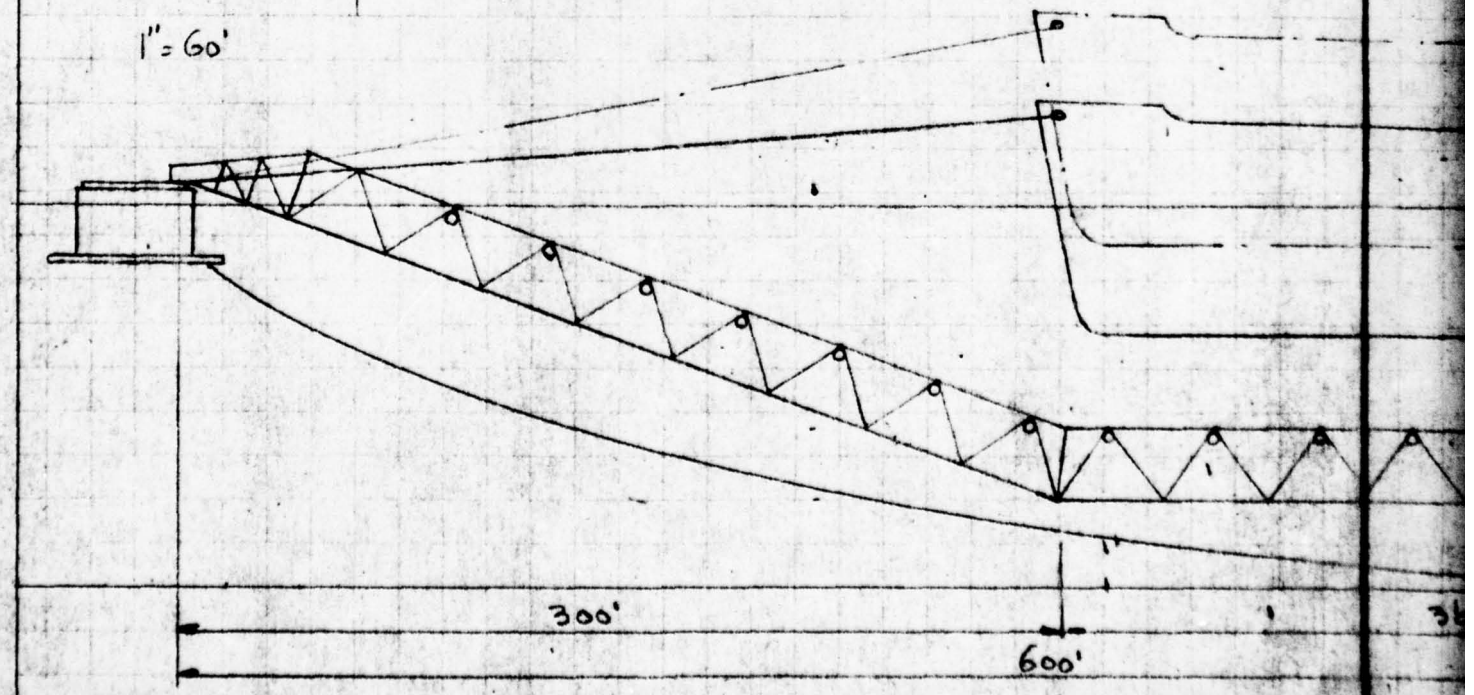
COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER NdB	CHECKED BY	DATE 4-11-66

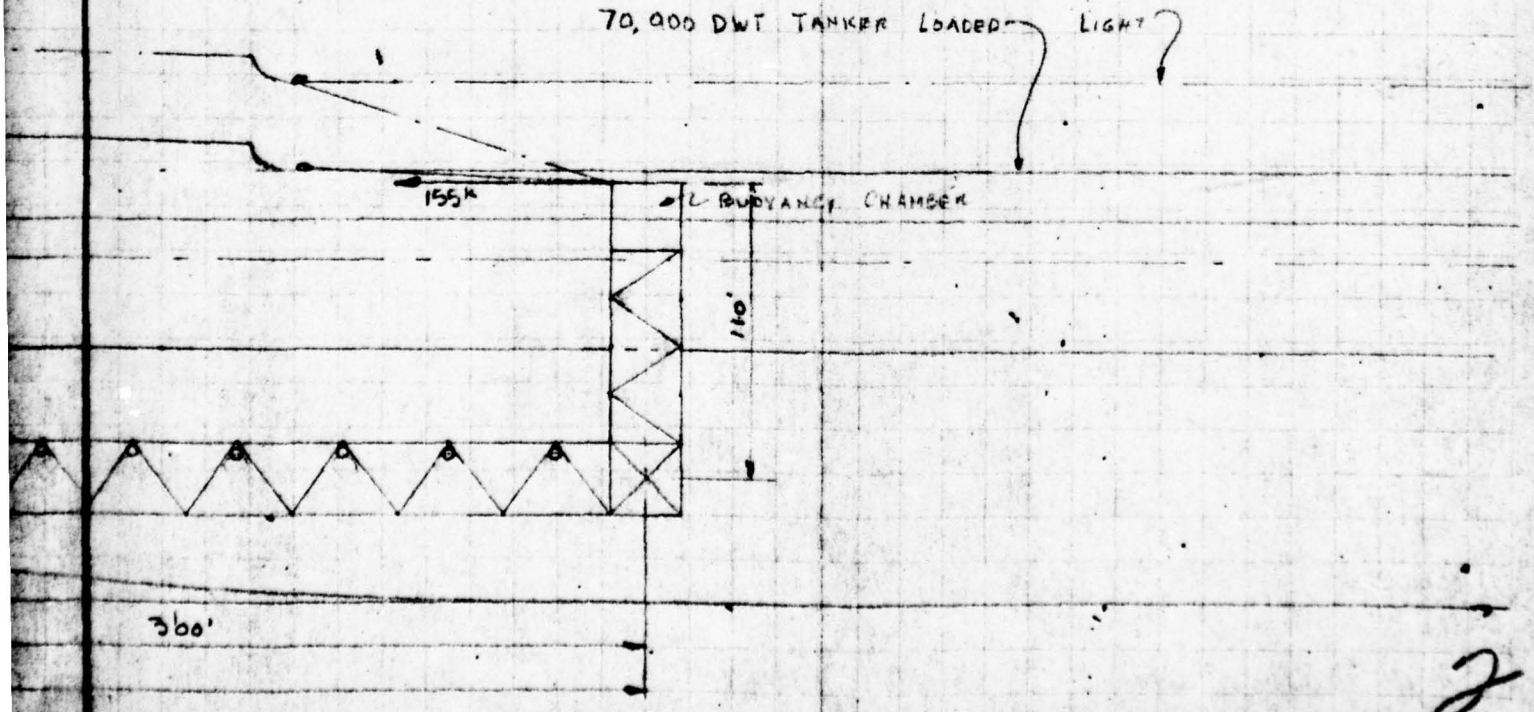
1" = 20'





1" = 60'




70,000 DWT TANKER LOADED
LIGHT
155'
BUOYANCY CHAMBER
110'
360'

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY | SHEET NO

SUBJECT: SCHEME 1 RIGID ARM DESIGN

DRAWING NUMBER | COMPUTER: NAB | CHECKED BY | DATE: 4-12-66

SCHEME 1

HORIZ. COMPR. LOAD IN ARM 155^K

MIN W.D. OVER ARM	
MAX DRAFT 20,000 DWT TANKER	44.0'
PROBABLE MAX PITCH AMPLITUDE IN 10' SIGN. WAVE HEIGHT 1.8×17.2	32.0'
PROBABLE MAX HEAVE AMPLITUDE IN 10' SIGN. WAVE HEIGHT $\frac{1.92 \times 8.6}{2}$	8.0'
MIN WATER DEPTH OVER ARM	84.0'
DEPTH OF ARM	26.0'
MAX HEAVE AMPLITUDE	8.0'
CLEARANCE	2.0'
MIN WATER DEPTH @ L.L.W.	110.0'

CHECK 26' DEEP TRIANGULAR ARM

MOM IN ARM = $155^K \times 110' = 17,050^{IK}$

COMPR IN ARM = 155^K

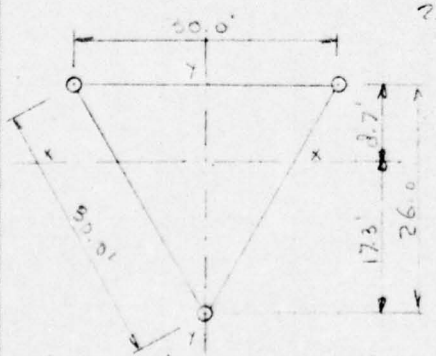
COMPR LOAD IN TOP CHORD = $\frac{17,050}{24} + 155 = 811^K$

TENSION IN BOTT CHORD = $\frac{17,050}{26} = 656^K$

WT. 105 #/FT

METAL IN TOP CHORD = $\frac{811}{145} = 5.6\ IN^2 \rightarrow 2 - 20$ #, 500 $A = 30.6$

METAL IN BOTT CHORD = $\frac{656}{23.7} = 28\ IN^2 \rightarrow 1 - 20$ #, 500



$I_X = 2 \times 30.6 \times (8.7 \times 12)^2 + 30.6 \times (17.3 \times 12)^2 = 1,985,836\ IN^4$

$S_b = \frac{1,985,836}{17.3 \times 12} = 9,565.7\ IN^3$ $S_T = \frac{1,985,836}{8.7 \times 12} = 18,992.7\ IN^3$

$r = \sqrt{\frac{1,985,836}{3 \times 30.6}} = 147.1\ IN$

$I_Y = 2 \times 30.6 \times 15^2 \times 12^2 = 1,982,880\ IN^4$

$r = \sqrt{\frac{1,982,880}{3 \times 30.6}} = 147.0\ IN$

$L/r = \frac{600 \times 12}{147} = 49 \rightarrow F_a = 18.44\ KSI$

$f_a = \frac{155}{3 \times 30.6} = 1.69\ KSI$ $\frac{f_a}{F_a} \times 100\% = 9.16\%$

$f_{b\ BOTT} = \frac{17,050 \times 12}{9,565.7} = 21.38\ KSI$ $f_{b\ TOP} = \frac{17,050 \times 12}{18,992.7} = 10.77\ KSI$

$f_{b\ TOP} + f_a = 10.77 + 1.69 = 12.46\ KSI < 18.44\ KSI$ OK

$f_{b\ BOTT} - f_a = 21.38 - 1.69 = 19.69\ KSI$ OK

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO.
SUBJECT			
DRAWING NUMBER	COMPUTER N A1	CHECKED BY	DATE 4-12-66

OVER ALL $L/r = \frac{600 \times 12}{147} = 49 \rightarrow F_a = 18.44$ KSI

$f_a = \frac{155}{5 \times 30.6} = 1.7$ KSI $\quad \frac{f_a}{F_a} \times 100 = \frac{1.7 \times 100}{18.44} = 9.2\%$ $\quad f_b = \frac{656}{30.6} = 21.4$ KSI

$f_b = \frac{811}{2 \times 30.6} = 13.3$ KSI

WT/FT OF ARM

CHORDS = 3×0.1050 = 0.3150 K/FT

LACING = $3 \times 1.9 \times 0.0286$ = 0.2059 K/FT

0.5209 K/FT

SPACING OF FLOAT = 52'

NET BUOYANCY/FLOAT = $52 \times 0.5209 = 27^K$

DISPL. FLOAT = $30 \times \frac{\pi D^2}{4} \times (0.069 - 0.0025) = 1.45 D^2$ K

WT FLOAT = $30 \times \pi D \times 0.0209 = 1.92 D$

$27 = 1.45 D^2 - 1.92 D \rightarrow D = \frac{1.92 + \sqrt{1.92^2 + 4 \times 1.45 \times 27}}{2 \times 1.45} = 5'$

CHECK NET BUOYANCY OF FLOAT

DISPL = $\frac{30 \times \pi \times 5^2}{4} \times 0.069$	=	37.7^K
WT FOAM $\frac{30 \times \pi \times 5^2}{4} \times 0.0025$	= −	1.5^K
WT SHELL $30 \times \pi \times 5 \times 0.0153$	= −	7.2^K
WT ENDS = $\frac{2 \times \pi \times 5^2}{4} \times 0.0153$	= −	0.6^K
NET BUOYANCY =		28.4^K

WT OF FLOAT = 9.3^K = $9.3/52 = 0.1788^K$/FT

WT OF ARM = $(600 + 110) \times (0.5209 + 0.1788)$ =	496.8^K
WT OF CONN.	15.0^K
WT OF BUOY (INCL ROT. DECK, EQUIP, SWIVEL & FOAM)	$1,080.0^K$

COST

ARM	496.8	×	650/2	= 161,460
CONN	15.0	×	2000/2	= 15,000
BUOY	1,080.0	×	1000/2	= 540,000
ANCHOR SYSTEM				400,000
SUBMARINE HOSE				225,000
LOADING HOSE				30,000
MOORING LINES				25,000
				1,396,460

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER MdS	CHECKED BY	DATE 4-12-66

WEIGHT / FT OF ARM

CHORDS $3 \times 0.1050 = 0.3150$

LACING $3 \times 1.415 \times 0.0905 = 0.1719$

$0.4869^{K}/FT$

FLOAT @ 52' ALONG LENTH OF ARM

NET BUOYANCY / FLOAT $= 52.0 \times 0.4869 = 25.3^{k}$

DISPL OF FLOAT $= 30 \times \frac{\pi D^2}{4} \times (0.064 - 0.0025) = 1.45D^2$

WT FLOAT $= 30 \times \pi D \times 0.0153 + \frac{2 \times \pi D^2}{4} \times 0.0153 = 1.44D + 0.02D^2$

$25.3 = 1.45D^2 - 0.02D^2 - 1.44D = 1.43D^2 - 1.44D$

$D = \frac{1.44 + \sqrt{1.44^2 + 4 \times 1.43 \times 25.3}}{2 \times 1.43} = \frac{1.44 + \sqrt{2.07 + 144.72}}{2.86} = 4.75'$

CHECK NET BUOYANCY OF FLOAT

DISPL $= \frac{1}{4} \times 30 \times \pi \times 4.75^2 \times 0.064 =$	34.0^{k}	
WT OF FOAM $\frac{0.0025}{0.064} \times 34.0 =$	-1.3^{k}	
WT OF SHELL $30 \times \pi \times 4.75 \times 0.0153 =$	-6.8^{k}	
WT OF ENDS $\frac{2}{4} \times \pi \times 4.75^2 \times 0.0153 =$	-0.5^{k}	
	25.4^{k} OK	

STEEL WT OF FLOAT $= 7.3^{k} = 7.3/52 = 0.1404^{k}/FT$

WT OF FOAM $= 1.3^{k} = 1.3/52 = 0.0250^{k}/FT$

WT OF ARM $= (600 + 110) \times (0.4869 + 0.1404) =$	445.4^{k}
WT OF FOAM IN FLOAT $= (600 + 110) \times 0.0250 =$	17.8^{k}
WT OF COMM.	15.0^{k}
WT OF BUOY	$1,013.0^{k}$
WT OF FOAM IN BUOY	67.0^{k}

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT	COST SCHEME 1		
DRAWING NUMBER	COMPUTER MdB	CHECKED BY	DATE 4-12-66

COST

ARM	445.4 x $325/K =	$ 145,000
COMM	20.0 x 1000/K =	20,000
BUOY	1,013.0 x 500/K =	507,000
ANCHOR SYSTEM	=	400,000
SUB MARINE HOSE	=	225,000
LOADING HOSE	=	30,000
MOORING LINES	=	25,000
		1,352,000
ADD 15%		173,000
TOTAL COST		$ 1,525,000

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY	SHEET NO.
SUBJECT	

DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

EVALUATION

1 FLOATING HOSE ELIMINATED
PREVENT SHIP FROM OVERRIDING BUOY
2 NO RIGID ARM EXCESSIVE IN SIZE
3
4
5 YES
6 YES
7 YES BY VARYING MOORING LINE LENGTH TO BUOY
8 NO
9 AT RIGID ARM FREE END FOR MOORING & HOSE HANDLING
10
11
12 YES
13 APPROX 80'
14
15 ON HANDLING DECK @ END OF RIGID ARM
16 LIMITED MIN W.D. AT LOCATION
RIGID ARM - ANCHOR LEG CLEARANCE
17 CONNECTION RIGID ARM TO BUOY
WAVE ACTION ON RIGID ARM
18

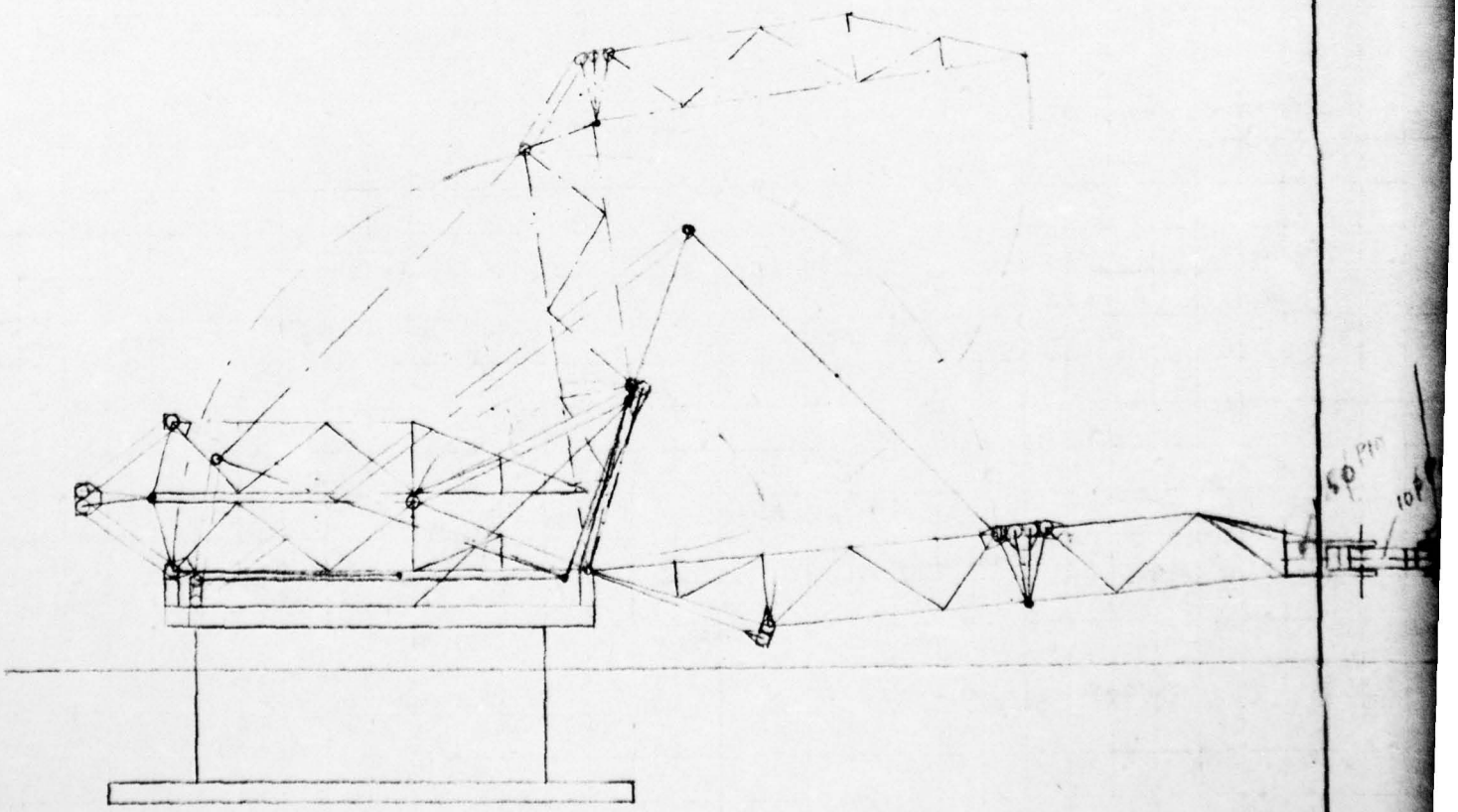
ENGINEERING DEPARTMENT
COMPUTATION SHEET

J. RAY McDERMOTT & CO., INC.

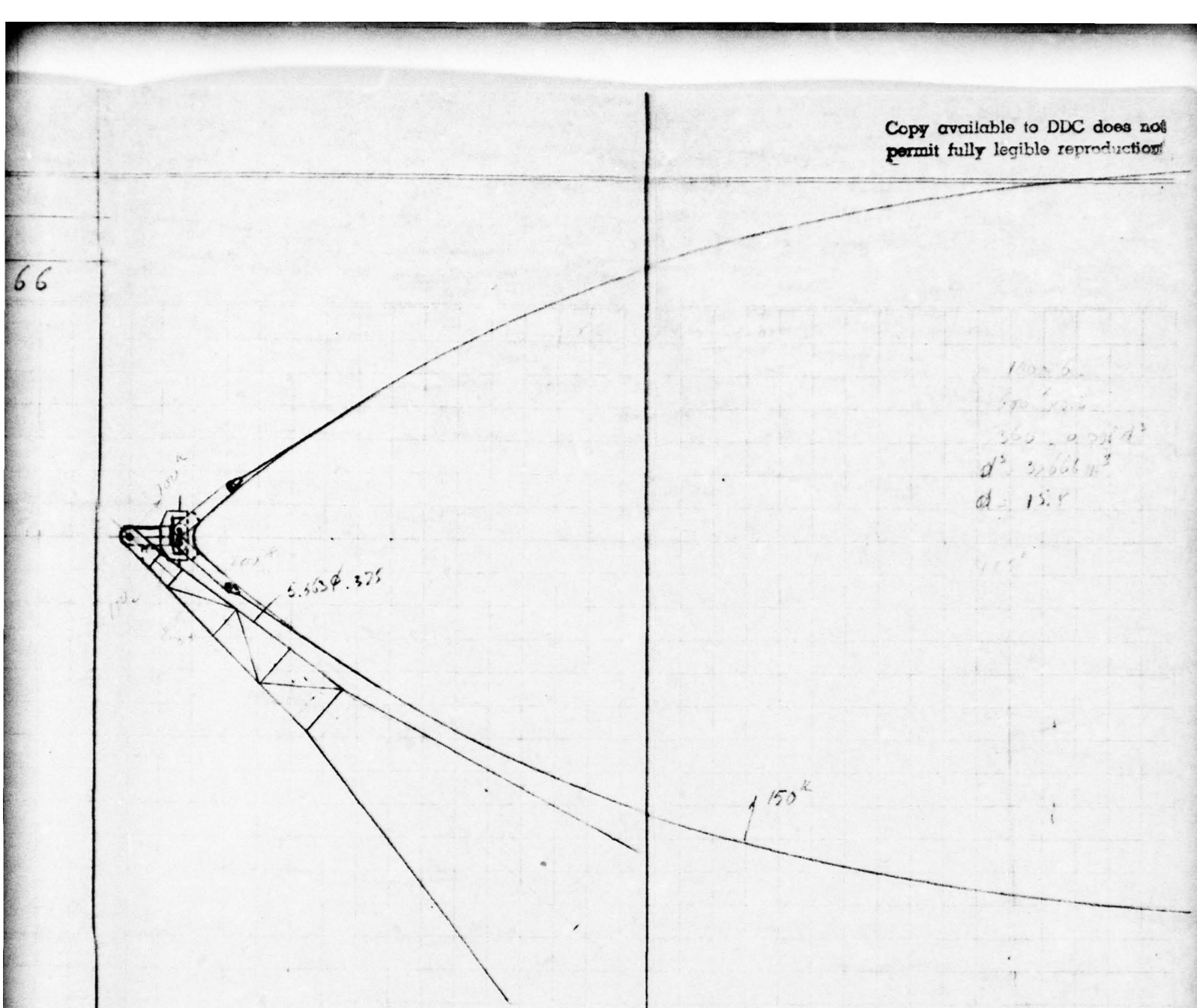
McD 14-003

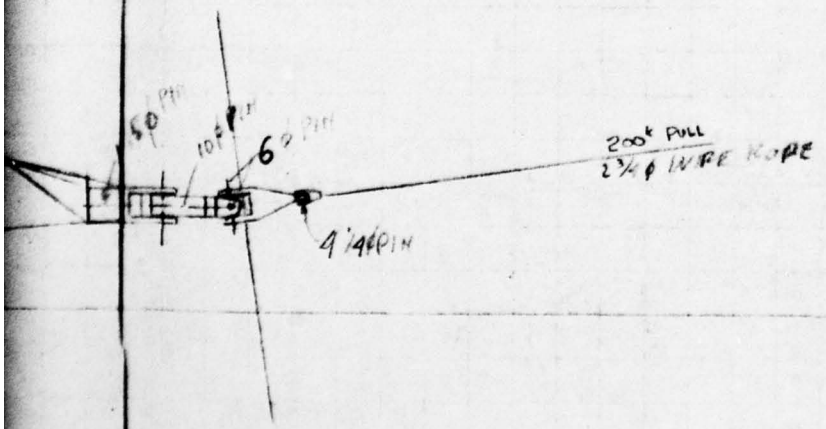
COMPANY			SHEET NO
SUBJECT: SCHEME 3			
DRAWING NUMBER	COMPUTER: NdC	CHECKED BY	DATE: 4-14-66

1" = 20'



66





0.025

2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER MdB	CHECKED BY	DATE 1-19-66

SCHEME 3

BUOY WT 1,080.0 + 2 x π x (40+8) x 0.0192 + 6 x 2 x 16 x 0.0192 =	1,090.0 K
ARM WT.	20.0 K
CONNECTIONS	45.0 K
COUNTER WT	150.0 K

COST

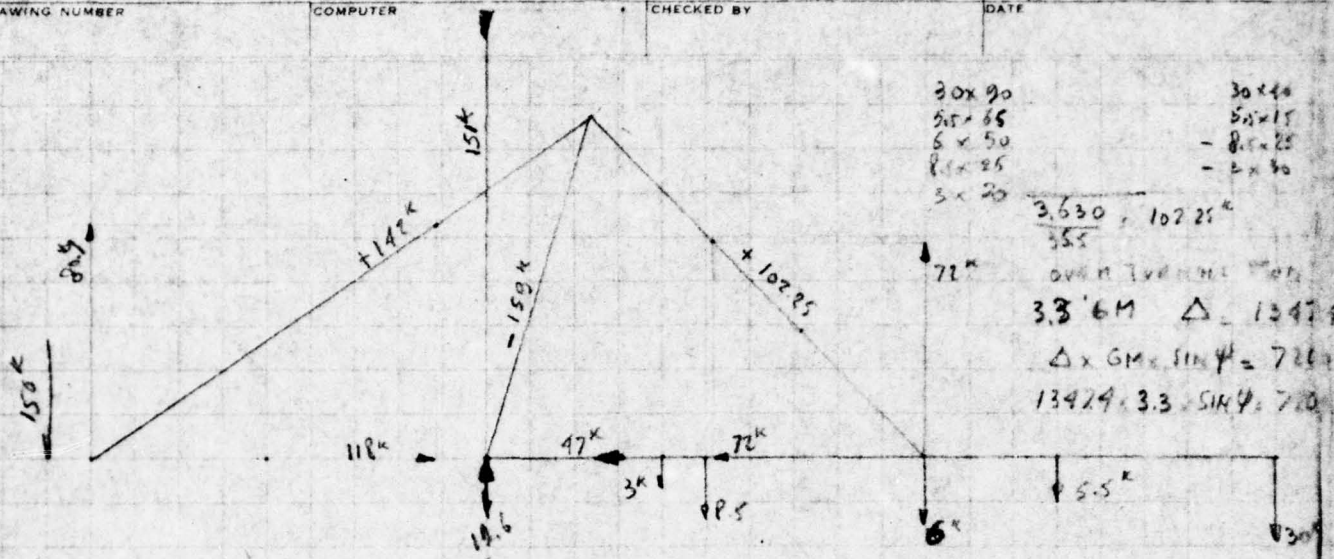
BUOY 1,090.0 x $500 =	545,000
ARM 20.0 x $325 =	7,000
CONNECTIONS 45.0 x 1000 =	45,000
COUNTERWT 150.0 x 150 =	23,000
ANCHOR SYSTEM =	200,000
SUB MARINE HOSE	225,000
FLOATING HOSE	300,000
MOORING LINES	30,000
	1,375,000
+ 15%	206,000
TOTAL	$ 1,581,000
MACH 300,000 + 15%	345,000
NO REDUCTION OF HOSES	1,926,000

COMPLICATED WITH MOVABLE COUNTERWEIGHT

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY	SHEET NO
SUBJECT	
DRAWING NUMBER	COMPUTER
CHECKED BY	DATE



30 x 90
5.5 x 65
6 x 50
8.5 x 25
3 x 20
3,630 , 107.25K

30 x 40
5.5 x 15
- 8.5 x 25
- 6 x 30
380

3.3'6M Δ 13424

Δ x GM x SIN Ψ = 726

13424 x 3.3 x SIN Ψ = 726

(1256.6 - 50.3) x 0.064 = 77.2K/FT

203 - 60 = 143K

143/77.2 = 2' Buoy 40'Ø x 22'

30 × 40
5.5 × 15
− 8.5 × 25
− 3 × 30

= 102.25^k

980 / 35

… Turning Mom … 60^{'k}

… GM Δ = 13479^k

GM × SIN ψ = 7260

… × 3.3 × SIN ψ = 7260   SIN ψ = 7260 / (13479 × 3.3) = 1.63

5^k

30^k

ENGINEERING DEPARTMENT
COMPUTATION SHEET
NCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO.
SUBJECT			
DRAWING NUMBER	COMPUTER NdB	CHECKED BY	DATE 4-11-66

70,000 DWT TANKER LIGHT 150' WD $\chi = 0°$ TW = 12 SEC

0° $\sqrt{(100 - 0.89 + 2.27)^2 + (15.67 + 9.86)^2} - 100 = \sqrt{101.43^2 + 20.53^2} - 100 = +3.99$

30° $\sqrt{(100 - 1.16 - 0.05)^2 + (11.19 + 1.03)^2} - 100 = \sqrt{98.79^2 + 12.17^2} - 100 = -0.46$

60° $\sqrt{(100 - 1.16 - 2.35)^2 + (3.62 - 3.08)^2} - 100 = \sqrt{96.49^2 + 0.54^2} - 100 = -3.51$

90° $\sqrt{(100 - 0.89 - 4.03)^2 + (-4.86 - 6.36)^2} - 100 = \sqrt{95.13^2 + 11.22^2} - 100 = -4.21$

120° $\sqrt{(100 - 0.31 - 4.62)^2 + (-12.05 - 7.94)^2} - 100 = \sqrt{95.07^2 + 19.99^2} - 100 = -2.85$

150° $\sqrt{(100 + 0.31 - 3.98)^2 + (-16.01 - 7.35)^2} - 100 = \sqrt{96.33^2 + 23.40^2} - 100 = -0.87$

180° $\sqrt{(100 + 0.89 - 2.27)^2 + (-15.67 - 4.86)^2} - 100 = \sqrt{98.57^2 + 20.53^2} - 100 = +0.69$

210° $\sqrt{(100 + 1.16 + 0.05)^2 + (-11.19 - 1.03)^2} - 100 = \sqrt{101.23^2 + 12.17^2} - 100 = +1.96$

240° $\sqrt{(100 + 1.16 + 2.35)^2 + (-3.62 + 3.08)^2} - 100 = \sqrt{103.51^2 + 0.54^2} - 100 = +3.51$

270° $\sqrt{(100 + 0.89 + 4.03)^2 + (4.86 + 6.36)^2} - 100 = \sqrt{104.87^2 + 11.22^2} - 100 = +5.47$

300° $\sqrt{(100 + 0.31 + 4.62)^2 + (12.05 + 7.94)^2} - 100 = \sqrt{109.23^2 + 19.99^2} - 100 = +6.82$

330° $\sqrt{(100 - 0.31 + 3.98)^2 + (16.01 + 7.35)^2} - 100 = \sqrt{103.67^2 + 23.40^2} - 100 = +6.28$

MAX AMPLITUDE = $\frac{4.21 + 6.82}{2} = 5.52'$

ACCELERATION = $\left(\frac{2\pi}{12}\right)^2 \times 5.52 = 1.51'/SEC^2$

WAVE FORCE MOORING LOAD = Ma = $1.51 \times 89.3 = 127.3^K$

WIND & CURRENT MOORING LOAD = 53.6^K

DESIGN LOAD MOORING CONNECTION = $127.3 + 53.6 = \underline{180^K}$

DESIGN LOAD SPACER = $127.3 - 53.6 = \underline{73.7^K}$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
NED 14003

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE
	NdB		4-14-66

22,500 DWT TANKER LIGHT 60' WD X = 10° Tw = 10 SEC

0° $\sqrt{(75-0.87+1.54)^2+(35-0.16+0.25)^2+(23.4+9.84+1.53)^2} - \sqrt{75^2+35^2+23.4^2} - 86.01 = \sqrt{\quad}^2 + 36^2 +$

30° $\sqrt{(75-1.19+2.55)^2+(35-0.13+0.93)^2+(23.4+7.41+5.19)^2} - 86.01 = \sqrt{\quad}^2 + 36^2 +$

60° $\sqrt{(75-1.18+2.88)^2+(35-0.17+0.18)^2+(23.4+3.00+7.16)^2} - 86.01 = \sqrt{76.\quad}^2 +$

90° $\sqrt{(75-0.86+2.44)^2+(35-0.11+0.41)^2+(23.4-2.21+7.73)^2} - 86.01 = \sqrt{76.5^2} + 35$

120° $\sqrt{(75-0.31+1.39)^2+(35-0.01+0.23)^2+(23.4-6.84+5.93)^2} - 86.01 = \sqrt{76.03^2} + 35$

150° $\sqrt{(75+0.32-0.12)^2+(35+0.08-0.01)^2+(23.4-9.63+2.54)^2} - 86.01 = \sqrt{75.20^2} + 35$

180° $\sqrt{(75+0.87-1.54)^2+(35+0.16-0.25)^2+(23.4-9.84+1.53)^2} - 86.01 = \sqrt{74.33^2} + 35$

210° $\sqrt{(75+1.19-2.55)^2+(35+0.13-0.93)^2+(23.4-7.41-5.19)^2} - 86.01 = \sqrt{73.64^2} + 35$

240° $\sqrt{(75+1.18-2.88)^2+(35+0.17-0.18)^2+(23.4-3.00-7.16)^2} - 86.01 = \sqrt{73.30^2} + 34$

270° $\sqrt{(75+0.86-2.44)^2+(35+0.11-0.41)^2+(23.4+2.21-7.73)^2} - 86.01 = \sqrt{73.47^2} + 34$

300° $\sqrt{(75+0.31-1.39)^2+(35+0.01-0.23)^2+(23.4+6.84-5.93)^2} - 86.01 = \sqrt{73.97^2} + 34$

330° $\sqrt{(75-0.32+0.12)^2+(35-0.08+0.01)^2+(23.4+9.63-2.54)^2} - 86.01 = \sqrt{74.80^2} + 34$

MAX AMPLITUDE = $\frac{5.97+3.82}{2} = 4.68$ ACCELERATION = $(2\pi/Tw)^2 \times Z$

22,500 DWT TANKER LOADED 60' WD X = 10° Tw = 10 SEC

0° $\sqrt{(75-0.88+1.33)^2+(35-0.12-0.99)^2+(2.30+12.80+2.20)^2} - 82.80 = \sqrt{75.45^2+33.8}$

30° $\sqrt{(75-1.20+2.29)^2+(35-0.15-0.65)^2+(2.30+9.41+5.83)^2} - 82.80 = \sqrt{76.09^2+34.2}$

60° $\sqrt{(75-1.19+2.63)^2+(35-0.14-0.18)^2+(2.30+3.86+7.90)^2} - 82.80 = \sqrt{76.44^2+34.7}$

90° $\sqrt{(75-0.87+2.26)^2+(35-0.10+0.43)^2+(2.30-2.65+2.85)^2} - 82.80 = \sqrt{76.39^2+35.33}$

120° $\sqrt{(75-0.31+1.29)^2+(35-0.02+0.87)^2+(2.30-8.50+5.70)^2} - 82.80 = \sqrt{75.98^2+35.85}$

150° $\sqrt{(75+0.32-0.02)^2+(35+0.05+1.07)^2+(2.30-12.50+2.02)^2} - 82.80 = \sqrt{75.30^2+36.12}$

180° $\sqrt{(75+0.88-1.33)^2+(35+0.12+0.99)^2+(2.30-12.40-2.20)^2} - 82.80 = \sqrt{74.55^2+36.11}$

210° $\sqrt{(75+1.20-2.29)^2+(35+0.15+0.65)^2+(2.30-9.41-5.83)^2} - 82.80 = \sqrt{73.91^2+35.80}$

240° $\sqrt{(75+1.19-2.63)^2+(35+0.14+0.13)^2+(2.30-3.86-7.90)^2} - 82.80 = \sqrt{73.56^2+35.27}$

270° $\sqrt{(75+0.87-2.26)^2+(35+0.10-0.43)^2+(2.30+2.65-2.85)^2} - 82.80 = \sqrt{73.61^2+35.67}$

300° $\sqrt{(75+0.31-1.29)^2+(35+0.02-0.87)^2+(2.30+8.50-5.70)^2} - 82.80 = \sqrt{74.02^2+35.15}$

330° $\sqrt{(75+0.32-0.02)^2+(35+0.05-1.07)^2+(2.30+12.50-2.02)^2} - 82.80 = \sqrt{75.30^2+35.86}$

MAX AMPLITUDE = $\frac{2.43+1.38}{2} = 1.91$ ACCELERATION = $(2\pi/Tw)^2 \times Z$

$\sqrt{\quad^2 + 37^2}$ 23.4^2 $= \sqrt{75.67^2 + 35.09^2 + 39.72^2} - \sqrt{75^2 + 35^2 + 23.4^2} = \sqrt{8,166.21} - \sqrt{7,127.56} = +1.36$

$= \sqrt{\quad^2 + 35.29^2 + 36.00^2} - 86.01 = \sqrt{8,368.71} - 86.01 = 91.48 - 86.01 = +\ 5.47$

$\sqrt{76.\quad^2 + 35.31^2 + 33.86^2} - 86.01 = \sqrt{8,276.19} - 86.01 = 90.97 - 86.01 = +\ 4.96$

$\sqrt{76.5^2 + 35.30^2 + 28.12^2} - 86.01 = \sqrt{7,996.95} - 86.01 = 89.15 - 86.01 = +\ 3.14$

$\sqrt{76.03^2 + 35.22^2 + 27.49^2} - 86.01 = \sqrt{7,526.81} - 86.01 = 86.76 - 86.01 = +\ 0.75$

$\sqrt{75.20^2 + 35.07^2 + 16.34^2} - 86.01 = \sqrt{7,150.56} - 86.01 = 84.56 - 86.01 = -\ 1.45$

$\sqrt{74.33^2 + 34.91^2 + 15.09^2} - 86.01 = \sqrt{6,971.37} - 86.01 = 83.49 - 86.01 = -\ 2.52$

$\sqrt{73.54^2 + 34.76^2 + 10.80^2} - 86.01 = \sqrt{6,747.75} - 86.01 = 82.14 - 86.01 = -\ 3.87$

$\sqrt{73.30^2 + 34.69^2 + 12.94^2} - 86.01 = \sqrt{6,743.73} - 86.01 = 82.12 - 86.01 = -\ 3.89$

$\sqrt{73.47^2 + 34.70^2 + 12.88^2} - 86.01 = \sqrt{6,914.28} - 86.01 = 83.15 - 86.01 = -\ 2.86$

$\sqrt{73.97^2 + 34.78^2 + 24.31^2} - 86.01 = \sqrt{7,272.19} - 86.01 = 85.28 - 86.01 = -\ 0.73$

$\sqrt{74.80^2 + 34.93^2 + 30.49^2} - 86.01 = \sqrt{7,744.79} - 86.01 = 88.00 - 86.01 = +\ 1.99$

$2\pi/T^2 \times Z = 0.628^2 \times 4.68 = 1.85$ FT/SEC^2 WAVE FORCE MOVING LOAD $= 1.85 \times 83.7 = 154.8^k$

$\sqrt{75.45^2 + 33.89^2 + 16.30^2} - 82.80 = \sqrt{7,126.84} - 82.80 = 84.42 - 82.80 = +\ 1.62$

$\sqrt{76.09^2 + 34.20^2 + 17.59^2} - 82.80 = \sqrt{7,266.38} - 82.80 = 85.23 - 82.80 = +\ 2.43$

$\sqrt{76.44^2 + 34.73^2 + 19.06^2} - 82.80 = \sqrt{7,346.93} - 82.80 = 85.13 - 82.80 = +\ 2.33$

$\sqrt{75.39^2 + 35.33^2 + 7.50^2} - 82.80 = \sqrt{7,139.89} - 82.80 = 84.50 - 82.80 = +\ 1.70$

$\sqrt{75.18^2 + 35.85^2 + 0.50^2} - 82.80 = \sqrt{7,058.43} - 82.80 = 84.01 - 82.80 = +\ 1.21$

$\sqrt{75.30^2 + 35.12^2 + 8.18^2} - 82.80 = \sqrt{7,091.66} - 82.80 = 83.91 - 82.80 = +\ 1.11$

$\sqrt{75.55^2 + 35.11^2 + 12.30^2} - 82.80 = \sqrt{7,012.92} - 82.80 = 83.79 - 82.80 = +\ 0.99$

$\sqrt{75.91^2 + 35.80^2 + 11.91^2} - 82.80 = \sqrt{6,911.77} - 82.80 = 83.19 - 82.80 = +\ 0.39$

$\sqrt{75.56^2 + 35.27^2 + 9.46^2} - 82.80 = \sqrt{6,799.54} - 82.80 = 82.13 - 82.80 = -\ 0.67$

$\sqrt{75.21^2 + 35.67^2 + 2.90^2} - 82.80 = \sqrt{6,628.85} - 82.80 = 81.42 - 82.80 = -\ 1.38$

$\sqrt{75.02^2 + 35.15^2 + 5.10^2} - 82.80 = \sqrt{6,671.19} - 82.80 = 81.68 - 82.80 = -\ 1.12$

$\sqrt{75.30^2 + 35.86^2 + 12.78^2} - 82.80 = \sqrt{6,981.27} - 82.80 = 83.55 - 82.80 = +\ 0.75$

$(2\pi/T)^2 \times Z \quad 0.628^2 \times 1.91 = 0.75$ FT/SEC^2 WAVE FORCE LOAD $= 0.75 \times 83.7 = 62.8^k$

2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY MCDERMOTT & CO., INC.

COMPANY | SHEET NO

SUBJECT

DRAWING NUMBER | COMPUTER NdB | CHECKED BY | DATE 4-14-66

22,500 DWT TANKER LIGHT 150' WD X = 60° TW = 10SEC

0° $\sqrt{(75-0.87+0.87)^2+(35-0.16+0.14)^2+(23.4+0.84+1.94)^2} - 86.01 = \sqrt{75.00^2+34.}$

30° $\sqrt{(75-1.19+1.64)^2+(35-0.15+0.27)^2+(23.4+2.41+5.61)^2} - 86.01 = \sqrt{75.5^2+35.0}$

60° $\sqrt{(75-1.18+1.96)^2+(35-0.17+0.33)^2+(23.4+3.00+7.72)^2} - 86.01 = \sqrt{75.76^2+35.16}$

90° $\sqrt{(75-0.86+1.76)^2+(35-0.11+0.30)^2+(23.4-2.21+7.87)^2} - 86.01 = \sqrt{75.90^2+35.1}$

120° $\sqrt{(75-0.31+1.09)^2+(35-0.01+0.18)^2+(23.4-6.84+5.85)^2} - 86.01 = \sqrt{75.78^2+35.12}$

150° $\sqrt{(75+0.32+0.12)^2+(35+0.08+0.02)^2+(23.4-9.63+2.26)^2} - 86.01 = \sqrt{75.44^2+35.10}$

180° $\sqrt{(75+0.87-0.87)^2+(35+0.16-0.14)^2+(23.4-3.84-1.94)^2} - 86.01 = \sqrt{75.00^2+35.02}$

210° $\sqrt{(75+1.19-1.64)^2+(35+0.19-0.27)^2+(23.4-7.41-5.61)^2} - 86.01 = \sqrt{74.55^2+34.92}$

240° $\sqrt{(75+1.18-1.96)^2+(35+0.17-0.33)^2+(23.4-8.00-7.79)^2} - 86.01 = \sqrt{74.22^2+34.84}$

270° $\sqrt{(75+0.86-1.76)^2+(35+0.11-0.30)^2+(23.4+2.21-7.87)^2} - 86.01 = \sqrt{74.10^2+34.81}$

300° $\sqrt{(75+0.31-1.09)^2+(35+0.01-0.18)^2+(23.4+6.84-5.85)^2} - 86.01 = \sqrt{74.22^2+34.83}$

330° $\sqrt{(75-0.32-0.12)^2+(35-0.08-0.02)^2+(23.4+9.63-2.26)^2} - 86.01 = \sqrt{74.56^2+34.90}$

MAX AMPLITUDE = $\frac{4.82+3.06}{2}$ = 3.94 ACCELERATION = $\left(\frac{2\pi}{Tw}\right)^2 \times 3.94 =$

22,500 DWT TANKER LOADED 150' WD X = 60° TW = 10SEC

0° $\sqrt{(75-0.88+0.79)^2+(35-0.12+0.78)^2+(2.30+12.94+1.90)^2} - 82.80 = \sqrt{74.91^2+.66^2+}$

30° $\sqrt{(75-1.20+1.51)^2+(35-0.15+0.93)^2+(2.30+9.41+3.51)^2} - 82.80 = \sqrt{75.31^2+.78^2+}$

60° $\sqrt{(75-1.19+1.82)^2+(35-0.14+0.84)^2+(2.30+3.80+7.64)^2} - 82.80 = \sqrt{75.63^2+.70^2+}$

90° $\sqrt{(75-0.87+1.65)^2+(35-0.10+0.52)^2+(2.30-2.65+7.72)^2} - 82.80 = \sqrt{75.78^2+.42^2+}$

120° $\sqrt{(75-0.31+1.03)^2+(35-0.02+0.06)^2+(2.30-8.50+5.79)^2} - 82.80 = \sqrt{75.72^2+.04^2+}$

150° $\sqrt{(75+0.32+0.14)^2+(35+0.05-0.42)^2+(2.30-12.06+2.21)^2} - 82.80 = \sqrt{75.46^2+.63^2+}$

180° $\sqrt{(75+0.80-0.79)^2+(35+0.12-0.78)^2+(2.30+12.40-1.90)^2} - 82.80 = \sqrt{75.01^2+.34^2+}$

210° $\sqrt{(75+1.20-1.51)^2+(35+0.15-0.93)^2+(2.30-9.41-5.51)^2} - 82.80 = \sqrt{74.69^2+.22^2+}$

240° $\sqrt{(75+1.19-1.82)^2+(35+0.14-0.84)^2+(2.30-3.80-7.64)^2} - 82.80 = \sqrt{74.37^2+.30^2+}$

270° $\sqrt{(75+0.87-1.65)^2+(35+0.10-0.52)^2+(2.30+2.65-7.72)^2} - 82.80 = \sqrt{74.22^2+.08^2+}$

300° $\sqrt{(75+0.31-1.03)^2+(35+0.02-0.06)^2+(2.30+8.50-5.79)^2} - 82.80 = \sqrt{74.28^2+.16^2+}$

330° $\sqrt{(75-0.32-0.14)^2+(35-0.05+0.42)^2+(2.30+12.06-2.21)^2} - 82.80 = \sqrt{74.51^2+.37^2+}$

MAX AMPLITUDE = $\frac{2.34+0.87}{2}$ = 1.61 ACCELERATION = $\left(\frac{2\pi}{Tw}\right)^2 \times 1.61 =$

105 Ft

$\sqrt{[illegible]^2 + 34.98^2 + 35.18^2}$	$- 86.01 =$	$\sqrt{8,086.23}$	$- 86.01 =$	$89.92 - 86.01 = +3.91$
$\sqrt{35.8^2 + 35.08^2 + 36.42^2}$	$- 86.01 =$	$\sqrt{8,249.73}$	$- 86.01 =$	$90.83 - 86.01 = +4.82$
$\sqrt{35.78^2 + 35.16^2 + 34.19^2}$	$- 86.01 =$	$\sqrt{8,197.79}$	$- 86.01 =$	$90.27 - 86.01 = +4.26$
$\sqrt{35.90^2 + 35.19^2 + 29.06^2}$	$- 86.01 =$	$\sqrt{7,843.63}$	$- 86.01 =$	$88.56 - 86.01 = +2.55$
$\sqrt{35.78^2 + 35.17^2 + 27.41^2}$	$- 86.01 =$	$\sqrt{7,481.75}$	$- 86.01 =$	$86.50 - 86.01 = +0.49$
$\sqrt{35.44^2 + 35.10^2 + 16.03^2}$	$- 86.01 =$	$\sqrt{7,180.16}$	$- 86.01 =$	$84.74 - 86.01 = -1.27$
$\sqrt{35.00^2 + 35.02^2 + 11.62^2}$	$- 86.01 =$	$\sqrt{6,986.42}$	$- 86.01 =$	$83.58 - 86.01 = -2.43$
$\sqrt{34.55^2 + 34.92^2 + 10.38^2}$	$- 86.01 =$	$\sqrt{6,884.85}$	$- 86.01 =$	$82.97 - 86.01 = -3.04$
$\sqrt{34.22^2 + 34.84^2 + 12.61^2}$	$- 86.01 =$	$\sqrt{6,881.45}$	$- 86.01 =$	$82.95 - 86.01 = -3.06$
$\sqrt{34.10^2 + 34.81^2 + 17.74^2}$	$- 86.01 =$	$\sqrt{7,017.23}$	$- 86.01 =$	$83.77 - 86.01 = -2.29$
$\sqrt{34.22^2 + 34.83^2 + 24.39^2}$	$- 86.01 =$	$\sqrt{7,316.61}$	$- 86.01 =$	$85.54 - 86.01 = -0.47$
$\sqrt{34.56^2 + 34.90^2 + 30.77^2}$	$- 86.01 =$	$\sqrt{7,729.00}$	$- 81.01 =$	$87.89 - 86.01 = +1.88$

$\frac{2\pi}{T})^2 \times 3.94 = 1.55$ FT/SEC^2 WAVE FORCE MOORING LOAD = $1.55 \times 84.3 = 130.7$ K

105 Ft

$\sqrt{33.91^2 + 35.66^2 + 16.60^2}$	$- 82.80 =$	$\sqrt{7,158.70}$	$- 82.80 =$	$84.63 - 82.80 = +1.83$
$\sqrt{34.31^2 + 34.78^2 + 17.22^2}$	$- 82.80 =$	$\sqrt{7,248.33}$	$- 82.80 =$	$85.14 - 82.80 = +2.34$
$\sqrt{34.63^2 + 34.70^2 + 13.82^2}$	$- 82.80 =$	$\sqrt{7,185.66}$	$- 82.80 =$	$84.77 - 82.80 = +1.97$
$\sqrt{34.78^2 + 34.42^2 + 7.37^2}$	$- 82.80 =$	$\sqrt{7,051.50}$	$- 82.80 =$	$83.97 - 82.80 = +1.17$
$\sqrt{34.72^2 + 34.04^2 + 0.46^2}$	$- 82.80 =$	$\sqrt{6,961.53}$	$- 82.80 =$	$83.44 - 82.80 = +0.64$
$\sqrt{34.16^2 + 34.63^2 + 7.55^2}$	$- 82.80 =$	$\sqrt{6,950.45}$	$- 82.80 =$	$83.37 - 82.80 = +0.57$
$\sqrt{34.01^2 + 34.39^2 + 12.20^2}$	$- 82.80 =$	$\sqrt{6,949.79}$	$- 82.80 =$	$83.37 - 82.80 = +0.57$
$\sqrt{33.62^2 + 34.22^2 + 12.62^2}$	$- 82.80 =$	$\sqrt{6,902.87}$	$- 82.80 =$	$83.12 - 82.80 = +0.32$
$\sqrt{33.37^2 + 33.82^2 + 9.23^2}$	$- 82.80 =$	$\sqrt{6,792.58}$	$- 82.80 =$	$82.42 - 82.80 = -0.38$
$\sqrt{33.22^2 + 33.68^2 + 2.77^2}$	$- 82.80 =$	$\sqrt{6,712.06}$	$- 82.80 =$	$81.93 - 82.80 = -0.87$
$\sqrt{33.28^2 + 33.76 + 5.06^2}$	$- 82.80 =$	$\sqrt{6,785.32}$	$- 82.80 =$	$82.25 - 82.80 = -0.55$
$\sqrt{33.51^2 + 33.97 + 12.15^2}$	$- 82.80 =$	$\sqrt{6,959.87}$	$- 82.80 =$	$83.40 - 82.80 = +0.60$

$\frac{2\pi}{T})^2 \times [illegible] = 0.63$ FT/SEC^2 WAVE FORCE MOORING LOAD = $0.63 \times 84.3 = 53.1$ K

2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER NAB	CHECKED BY	DATE 4-15-66

22,500 DWT TANKER — 60' WD — $\chi = 0°$ — $T_w = 10$ SEC

LIGHT

0°	−0.16 + 0.25	= +0.09
30°	−0.19 + 0.43	= +0.24
60°	−0.17 + 0.48	= +0.31
90°	−0.11 + 0.41	= +0.30
120°	−0.01 + 0.23	= +0.22
150°	+0.08 − 0.01	= +0.09

MAX AMPLITUDE = 0.31

ACCELERATION = $\left(\frac{2\pi}{T_w}\right)^2 \times 0.31 = 0.12$ FT/SEC²

FENDER LOAD = 0.12 × 83.7 = 10 K

LOADED

	−0.12 − 0.99	= −1.11
	−0.15 − 0.65	= −0.80
	−0.14 − 0.13	= −0.27
	−0.10 + 0.43	= +0.33
	−0.02 + 0.87	= +0.85
	+0.05 + 1.07	= +1.12

MAX AMPLITUDE = 1.12

ACCELERATION = $\left(\frac{2\pi}{T_w}\right)^2 \times 1.12 = 0.44$

FENDER LOAD = 0.44 × 83.7 = 36.8 K

22,500 DWT TANKER — 150 WD — $\chi = 10°$ — $T_w = 10$ SEC

LIGHT

0°	−0.16 + 0.14	= −0.02
30°	−0.19 + 0.27	= +0.08
60°	−0.17 + 0.33	= +0.16
90°	−0.11 + 0.30	= +0.19
120°	−0.01 + 0.18	= +0.17
150°	+0.08 + 0.02	= +0.10

MAX AMPLITUDE = 0.19

ACCELERATION = $\left(\frac{2\pi}{T_w}\right)^2 \times 0.19 = 0.07$ FT/SEC²

FENDER LOAD = 0.07 × 89.3 = 5.9 K

LOADED

	−0.12 + 0.78	= +0.66
	−0.15 + 0.93	= +0.78
	−0.14 + 0.84	= +0.70
	−0.10 + 0.52	= +0.42
	−0.02 + 0.06	= +0.04
	+0.05 − 0.42	= −0.37

MAX AMPLITUDE = 0.78

ACCELERATION = $\left(\frac{2\pi}{T_w}\right)^2 \times 0.78 = 0.31$ FT/SEC²

FENDER LOAD = 0.31 × 89.3 = 26.1 K

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE
	N.B.		4-19-66

70,000 DWT TANKER LIGHT 60' W.D. $\chi = 10°$ Tw = 12

0°	$\sqrt{(100-0.87-6.40)^2+(35-0.16-1.16)^2+(36.6+3.71+4.58)^2}$	$-112.09 =$	$\sqrt{92.3^2+$
30°	$\sqrt{(100-1.18-4.82)^2+(35-0.19-1.06)^2+(36.6+7.51+7.31)^2}$	$-112.09 =$	$\sqrt{94.0^2+$
60°	$\sqrt{(100-1.18-1.95)^2+(35-0.17-0.67)^2+(36.60+3.30+8.08)^2}$	$-112.09 =$	$\sqrt{96.8^2+$
90°	$\sqrt{(100-0.86+1.45)^2+(35-0.10-0.10)^2+(36.60-1.79+6.68)^2}$	$-112.09 =$	$\sqrt{100.5^2+$
120°	$\sqrt{(100-0.31+4.45)^2+(35+0.00+0.50)^2+(36.60-6.41+3.50)^2}$	$-112.09 =$	$\sqrt{104.19^2+$
150°	$\sqrt{(100+0.32+6.27)^2+(35+0.09+0.96)^2+(36.60-9.30-0.63)^2}$	$-112.09 =$	$\sqrt{106.59^2+$
180°	$\sqrt{(100+0.87+6.40)^2+(35+0.16+1.16)^2+(36.60-9.71-4.58)^2}$	$-112.09 =$	$\sqrt{107.27^2+$
210°	$\sqrt{(100+1.18+4.82)^2+(35+0.19+1.06)^2+(36.60-7.51-7.31)^2}$	$-112.09 =$	$\sqrt{106.00^2+$
240°	$\sqrt{(100+1.18+1.95)^2+(35+0.17+0.67)^2+(3660-3.30-8.08)^2}$	$-112.09 =$	$\sqrt{103.13^2+$
270°	$\sqrt{(100+0.86-1.45)^2+(35+0.10+0.10)^2+(36.60+1.79-6.68)^2}$	$-112.09 =$	$\sqrt{99.41^2+$
300°	$\sqrt{(100+0.31-4.45)^2+(35+0.00-0.50)^2+(36.60+6.41-3.50)^2}$	$-112.09 =$	$\sqrt{95.86^2+$
330°	$\sqrt{(100-0.32+6.27)^2+(35-0.09-0.96)^2+(36.60+9.30+0.63)^2}$	$-112.09 =$	$\sqrt{93.41^2+$

MAX AMPLITUDE = $\frac{3.55+2.18^2}{2}$ = 3.19 ACCELERATION = $\left(\frac{2\pi}{Tw}\right)^2 \times 3.1 = 0$

70.000 DWT TANKER LOADED 60' WD $\chi = 10°$ Tw = 12 Sec

0°	$\sqrt{(100-0.88-6.63)^2+(35-0.13-0.30)^2+(8.0+12.30+4.98)^2}$	$-106.25 =$	$\sqrt{92.9^2+$
30°	$\sqrt{(100-1.20-5.96)^2+(35-0.16-0.02)^2+(8.0+9.38+7.19)^2}$	$-106.25 =$	$\sqrt{92.4^2+$
60°	$\sqrt{(100-1.19-3.69)^2+(35-0.14+0.26)^2+(8.0+3.94+7.98)^2}$	$-106.25 =$	$\sqrt{95.2^2+$
90°	$\sqrt{(100-0.87-0.93)^2+(35-0.09+0.47)^2+(8.0-2.54+6.63)^2}$	$-106.25 =$	$\sqrt{98.2^2+$
120°	$\sqrt{(100-0.31+2.94)^2+(35-0.01+0.56)^2+(8.0-8.35+3.50)^2}$	$-106.25 =$	$\sqrt{102.6^2+$
150°	$\sqrt{(100+0.32+5.52)^2+(35+0.06+0.50)^2+(8.0-11.93-0.56)^2}$	$-106.25 =$	$\sqrt{105.8^2+$
180°	$\sqrt{(100+0.88+6.63)^2+(35+0.13+0.30)^2+(8.0-12.30-4.98)^2}$	$-106.25 =$	$\sqrt{107.5^2+$
210°	$\sqrt{(100+1.20+5.96)^2+(35+0.16+0.02)^2+(8.0-9.38-7.19)^2}$	$-106.25 =$	$\sqrt{107.16^2+$
240°	$\sqrt{(100+1.19+3.69)^2+(35+0.14-0.26)^2+(8.0-3.94-7.98)^2}$	$-106.25 =$	$\sqrt{104.8^2+$
270°	$\sqrt{(100+0.87+0.93)^2+(35+0.09-0.47)^2+(8.0+2.54-6.63)^2}$	$-106.25 =$	$\sqrt{101.3^2+$
300°	$\sqrt{(100+0.31-2.94)^2+(35+0.01-0.56)^2+(8.0+8.35-3.50)^2}$	$-106.25 =$	$\sqrt{97.3^2+$
330°	$\sqrt{(100-0.32-5.52)^2+(35-0.06-0.50)^2+(8.0+11.93+0.56)^2}$	$-106.25 =$	$\sqrt{94.16^2+$

MAX AMPLITUDE = $\frac{4.45+7.29}{2}$ = 5.87' ACCELERATION $\left(\frac{2\pi}{Tw}\right)^2 \times 87$

56

Tw 12 SEC

= √ 92.73² + 33.68² + 50.89² − 112.09	= √12,322.91 − 112.09	= 111.01 − 112.09	= − 1.08
√ 94.0² + 33.75² + 51.49² − 112.09	= √12,619.08 − 112.09	= 112.33 − 112.09	= + 0.24
√ 96.8² + 34.16² + 47.38² − 112.09	= √12,852.78 − 112.09	= 113.37 − 112.09	= + 1.28
√ 100.55² + 34.80² + 41.43² − 112.09	= √13,050.81 − 112.09	= 114.24 − 112.09	= + 2.15
√ 104.19² + 35.50² + 33.69² − 112.09	= √13,240.41 − 112.09	= 115.07 − 112.09	= + 2.98
√ 106.59² + 36.05² + 26.67² − 112.09	= √13,372.32 − 112.09	= 115.64 − 112.09	= + 3.55
√ 107.27² + 36.32² + 22.31² − 112.09	= √13,323.73 − 112.09	= 115.43 − 112.09	= + 3.34
√ 106.00² + 36.25² + 21.78² − 112.09	= √13,029.43 − 112.09	= 114.12 − 112.09	= + 2.03
√ 103.13² + 35.84² + 25.22² − 112.09	= √12,556.35 − 112.09	= 112.06 − 112.09	= − 0.03
√ 99.41² + 35.20² + 31.71² − 112.09	= √12,126.91 − 112.09	= 110.12 − 112.09	= − 1.97
√ 95.86² + 34.50² + 33.51² − 112.09	= √11,910.43 − 112.09	= 109.27 − 112.09	= − 2.82
√ 93.41² + 33.95² + 46.53² − 112.09	= √12,093.07 − 112.09	= 109.74 − 112.09	= − 2.35

× 3.14 = 0.87 FT/SEC WAVE FORCE MOORING LOAD = 0.87 × 83.7 = 72.8 K

12 SEC

= √ 92.19² + 34.57² + 29.78² − 106.25	= √10,363.52 − 106.25	= 101.80 − 106.25	= − 4.45
√ 92.4² + 34.82² + 29.57² − 106.25	= √10,435.38 − 106.25	= 102.15 − 106.25	= − 4.10
√ 95.2² + 35.12² + 19.92² − 106.25	= √10,698.09 − 106.25	= 103.33 − 106.25	= − 2.92
√ 98.2² + 35.38² + 12.09² − 106.25	= √10,133.60 − 106.25	= 105.54 − 106.25	= − 0.71
√ 102.6² + 35.55² + 3.12² − 106.25	= √11,806.45 − 106.25	= 108.66 − 106.25	= + 2.41
√ 105.8² + 35.58² + 4.49² − 106.25	= √12,486.78 − 106.25	= 111.74 − 106.25	= + 5.49
√ 107.5² + 35.43² + 8.78² − 106.25	= √12,890.77 − 106.25	= 113.54 − 106.25	= + 7.29
√ 107.16² + 35.18² + 8.57² − 106.25	= √12,709.34 − 106.25	= 113.11 − 106.25	= + 6.86
√ 104.8² + 34.88² + 3.92² − 106.25	= √12,231.20 − 106.25	= 110.60 − 106.25	= + 4.35
√ 101.3² + 34.62² + 3.91² − 106.25	= √11,475.52 − 106.25	= 107.12 − 106.25	= + 0.87
√ 97.3² + 34.45² + 12.85² − 106.25	= √10,832.89 − 106.25	= 104.09 − 106.25	= − 2.16
√ 94.16² + 34.44² + 20.43² − 106.25	= √10,472.06 − 106.25	= 102.33 − 106.25	= − 3.92

(2π)² × 87 = 1.61 FT/SEC² WAVE FORCE MOORING LOAD 1.61 × 83.7 = 134.8 K

2

AD-A034 246 MCDERMOTT (J RAY) CO INC NEW ORLEANS LA F/G 13/10
ENGINEERING DESIGN CALCULATIONS MONO-MOORING SYSTEM. VOLUME 5. --ETC(U)
1966 DA-44-009-AMC-841(T)
UNCLASSIFIED NL

2 OF 3
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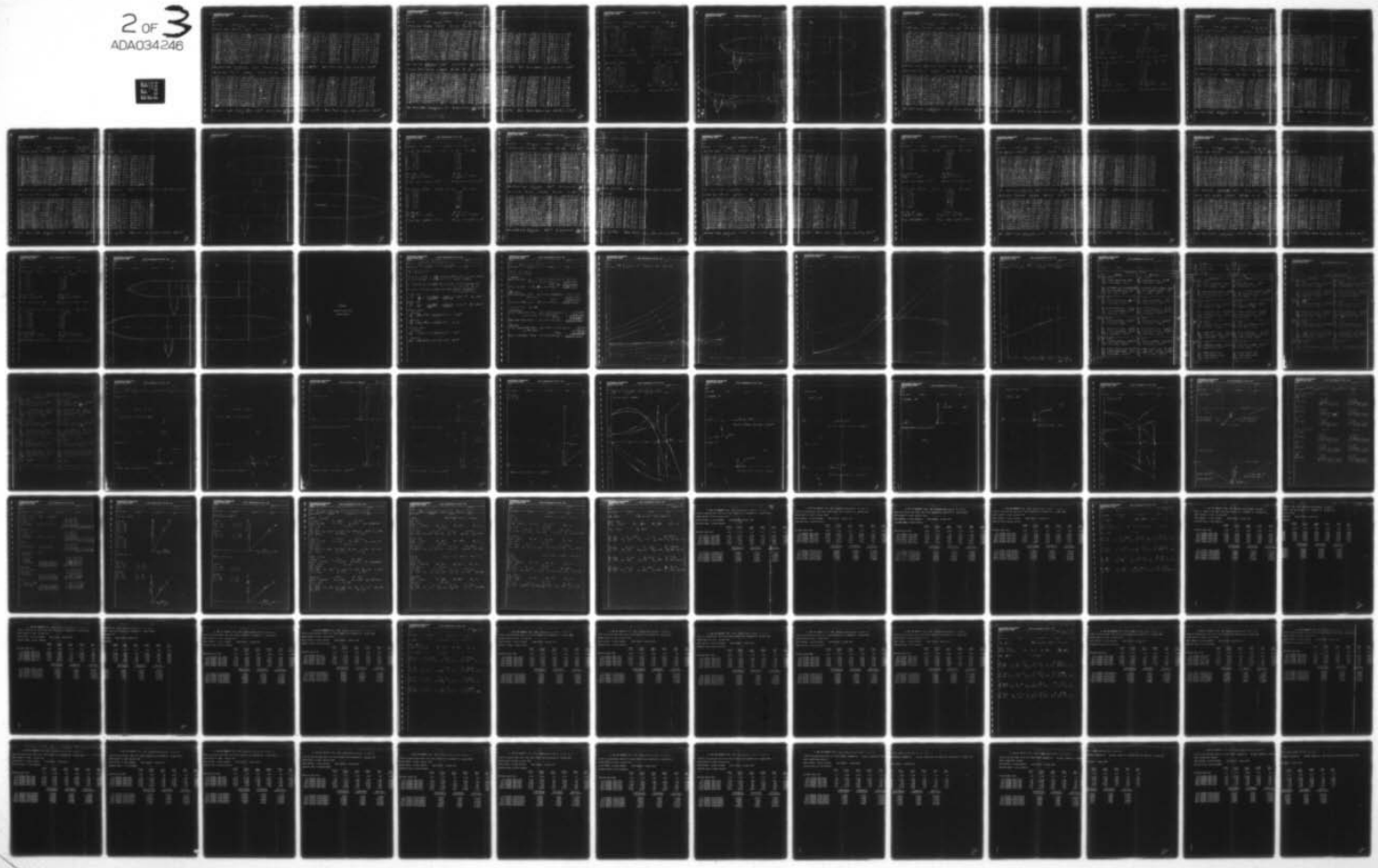
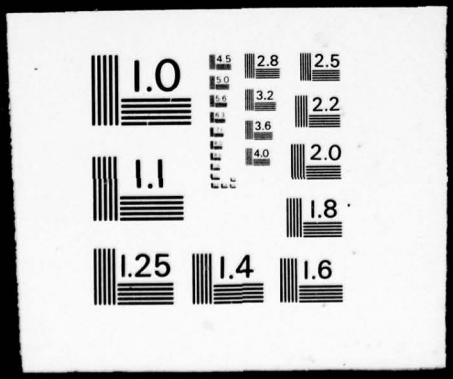




ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER N dB	CHECKED BY	DATE 4-15-66

70,000 DWT TANKER LIGHT 150' WD X = 10° TW = SEC

0°	$\sqrt{(100-0.87+5.74)^2+(35-0.16+0.72)^2+(36.6+3.71+4.39)^2}$	−112.09 =	$\sqrt{104.87}$ + 35.
30°	$\sqrt{(100-1.18+6.01)^2+(35-0.19+0.89)^2+(36.6+7.5+7.19)^2}$	−112.09	$\sqrt{109.83}$ + 35
60°	$\sqrt{(100-1.18+4.67)^2+(35-0.17+0.81)^2+(36.60+3.30+8.05)^2}$	−112.09	$\sqrt{103.79}$ + 35.
90°	$\sqrt{(100-0.86+2.07)^2+(35-0.10+0.52)^2+(36.60-1.79+6.78)^2}$	−112.09	$\sqrt{101.21}$ + 35
120°	$\sqrt{(100-0.31-1.08)^2+(35.0-0.00+0.09)^2+(36.60-6.41+3.68)^2}$	−112.09	$\sqrt{98.61}$ + 35.
150°	$\sqrt{(100+0.32-3.99)^2+(35.0+0.09-0.36)^2+(36.60-9.30-0.41)^2}$	−112.09	$\sqrt{96.38}$ + 34.
180°	$\sqrt{(100+0.87-5.74)^2+(35.0+0.16-0.72)^2+(36.60-3.71-4.39)^2}$	−112.09	$\sqrt{95.13}$ + 34.
210°	$\sqrt{(100+1.18-6.01)^2+(35.0+0.19-0.89)^2+(36.60-7.51-7.19)^2}$	−112.09	$\sqrt{95.17}$ + 34.
240°	$\sqrt{(100+1.18-4.67)^2+(35.0+0.17-0.81)^2+(36.60-3.30-8.05)^2}$	−112.09	$\sqrt{96.51}$ + 34.
270°	$\sqrt{(100+0.86-2.07)^2+(35.0+0.10-0.52)^2+(36.60+1.79-6.78)^2}$	−112.09	$\sqrt{98.79}$ + 34.
300°	$\sqrt{(100+0.31+1.08)^2+(35.0+0.00-0.09)^2+(36.60+6.41-3.68)^2}$	−112.09	$\sqrt{101.39}$ + 34.
330°	$\sqrt{(100-0.32+3.99)^2+(35.0-0.09+0.36)^2+(36.60+9.30+0.41)^2}$	−112.09	$\sqrt{103.62}$ + 35.

MAX AMPLITUDE = $\frac{9.96+8.58}{2}$ = 9.27 ACCELERATION = $\left(\frac{2\pi}{Tw}\right)^2 \times 9.27$ =

70,000 DWT TANKER LOADED 150' WD X = 10° TW = SE

0°	$\sqrt{(100-0.88+4.17)^2+(35-0.13-0.38)^2+(8.0+17.30+4.32)^2}$	−106.25 =	$\sqrt{103.8}$ + 34.
30°	$\sqrt{(100-1.20+5.09)^2+(35-0.16-0.07)^2+(8.0+9.38+7.13)^2}$	−106.25	$\sqrt{103.8}$ + 34.
60°	$\sqrt{(100-1.19+4.64)^2+(35-0.14+0.26)^2+(8.0+3.94+8.02)^2}$	−106.25	$\sqrt{103.}$ + 35.
90°	$\sqrt{(100-0.87+2.95)^2+(35-0.09+0.52)^2+(8.0-2.54+6.77)^2}$	−106.25	$\sqrt{102.}$ + 35.
120°	$\sqrt{(100-0.31+0.46)^2+(35-0.01+0.65)^2+(8.0-8.35+3.71)^2}$	−106.25	$\sqrt{100.}$ + 35.
150°	$\sqrt{(100+0.32-2.14)^2+(35+0.06+0.59)^2+(8.0-11.93-0.35)^2}$	−106.25	$\sqrt{98.}$ + 35.6
180°	$\sqrt{(100+0.88-4.17)^2+(35+0.13+0.38)^2+(8.0-17.30-4.32)^2}$	−106.25	$\sqrt{96.}$ + 35.5
210°	$\sqrt{(100+1.20-5.09)^2+(35+0.16+0.07)^2+(8.0-9.38-7.13)^2}$	−106.25	$\sqrt{95.}$ + 35.2
240°	$\sqrt{(100+1.19-4.64)^2+(35+0.14-0.26)^2+(8.0-3.94-8.02)^2}$	−106.25 =	$\sqrt{96.}$ + 34.8
270°	$\sqrt{(100+0.87-2.95)^2+(35+0.09-0.52)^2+(8.0+2.54-6.77)^2}$	−106.25	$\sqrt{97.}$ + 34.5
300°	$\sqrt{(100+0.31-0.46)^2+(35+0.01-0.65)^2+(8.0+8.35-3.71)^2}$	−106.25	$\sqrt{99.}$ + 34.
330°	$\sqrt{(100-0.32+2.14)^2+(35.-0.06+0.59)^2+(8.0+11.93+0.35)^2}$	−106.25	$\sqrt{101.}$ + 34.

MAX AMPLITUDE = $\frac{6.01+3.53}{2}$ = 4.77 FT ACCELERATION = $\left(\frac{2\pi}{TW}\right)$ × 4.7

SEC

1.87	+ 35.56² + 50.70² − 112.09	= √14,832.72	− 112.09	= 121.79 − 112.09	= + 9.70
1.83	+ 35.70² + 51.30² − 112.09	√14,895.51	− 112.09	= 122.05 − 112.09	= + 9.96
1.40	+ 35.64² + 47.96² − 112.09	√14,280.55	− 112.09	= 119.50 − 112.09	= + 7.41
1.21	+ 35.42² + 41.59² − 112.09	√13,227.77	− 112.09	= 115.01 − 112.09	= + 2.92
1.61	+ 35.09² + 33.87² − 112.09	√12,102.42	− 112.09	= 110.01 − 112.09	= − 2.08
1.38	+ 34.23² + 26.89² − 112.09	√11,218.35	− 112.09	= 105.92 − 112.09	= − 6.17
1.13	+ 34.44² + 22.50² − 112.09	√10,747.08	− 112.09	= 103.64 − 112.09	= − 8.45
1.17	+ 34.30² + 21.90² − 112.09	√10,713.93	− 112.09	= 103.51 − 112.09	= − 8.58
1.51	+ 34.35² + 25.24² − 112.09	√11,191.55	− 112.09	= 105.51 − 112.09	= − 6.58
1.79	+ 34.58² + 32.61² − 112.09	√11,954.93	− 112.09	= 109.34 − 112.09	= − 2.75
1.89	+ 34.91² + 39.33² − 112.09	√13,045.19	− 112.09	= 114.22 − 112.09	= + 2.13
1.62	+ 35.27² + 46.31² − 112.09	√14,125.59	− 112.09	= 118.85 − 112.09	= + 6.76

× 1.27 = 2.54 FT/SEC² WAVE FORCE MOORING LOAD = 2.54 × 84.3 = 214.1 K

2 SEC

103.2	+ 34.99² + 24.62² − 106.25	= √12,464.53	− 106.25	= 111.64 − 106.25	= + 5.39
13.81	+ 34.72² + 24.51² − 106.25	√12,602.83	− 106.25	= 112.26 − 106.25	= + 6.01
13.2	+ 35.12² + 19.96² − 106.25	√12,333.72	− 106.25	= 111.06 − 106.25	= + 4.81
12.0	+ 35.43² + 12.23² − 106.25	√11,825.18	− 106.25	= 108.74 − 106.25	= + 2.49
10.1	+ 35.64² + 3.36² − 106.25	√11,311.52	− 106.25	= 106.36 − 106.25	= + 0.11
8.1	+ 35.65² + 4.28² − 106.25	√10,928.55	− 106.25	= 104.54 − 106.25	= − 1.71
5.7	+ 35.51² + 8.62² − 106.25	√10,682.09	− 106.25	= 103.38 − 106.25	= − 2.87
7.1	+ 35.23² + 8.51² − 106.25	√10,550.71	− 106.25	= 102.72 − 106.25	= − 3.53
6.5	+ 34.88² + 3.96² − 106.25	√10,554.20	− 106.25	= 102.73 − 106.25	= − 3.52
7.7	+ 34.51² + 3.97² − 106.25	√10,797.62	− 106.25	= 103.91 − 106.25	= − 2.34
8.2	+ 34.36² + 12.69² − 106.25	√11,310.40	− 106.25	= 106.35 − 106.25	= + 0.10
8.2	+ 34.40² + 20.28² − 106.25	√11,961.95	− 106.25	= 109.37 − 106.25	= + 3.12

× 4.77 = 1.31 FT/SEC² WAVE FORCE MOORING LOAD = 1.31 × 84.3 = 110.4 K

2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE
	N 4B		4-18-66

22,500 DWT TANKER LIGHT 60' WD $\chi = 20°$ TW - 0 SEC

0°	$\sqrt{(75-0.96-0.38)^2+(35-0.38+0.00)^2+(23.4+7.54-5.66)^2}$	$-86.01 =$	$\sqrt{\quad^2+}$
30°	$\sqrt{(75-1.30+1.94)^2+(35-0.44+0.90)^2+(23.4+6.94-2.22)^2}$	$-86.01 =$	$\sqrt{\quad^2+}$
60°	$\sqrt{(75-1.29+3.74)^2+(35-0.37+1.56)^2+(23.4+3.60+1.82)^2}$	$-86.01 =$	$\sqrt{\quad^2+}$
90°	$\sqrt{(75-0.99+4.59)^2+(35-0.21+1.80)^2+(23.4-0.18+5.37)^2}$	$-86.01 =$	$\sqrt{\quad^2+}$
120°	$\sqrt{(75-0.33+4.13)^2+(35-0.00+1.56)^2+(23.4-3.93+7.43)^2}$	$-86.01 =$	$\sqrt{\quad^2+}$
150°	$\sqrt{(75+0.36+2.60)^2+(35+0.22+0.90)^2+(23.4-6.62+2.59)^2}$	$-86.01 =$	$\sqrt{\quad^2+}$
180°	$\sqrt{(75+0.96+0.38)^2+(35+0.38+0.00)^2+(23.4-7.54+5.66)^2}$	$-86.01 =$	$\sqrt{\quad^2+}$
210°	$\sqrt{(75+1.30-1.94)^2+(35+0.44-0.90)^2+(23.4-6.94+2.22)^2}$	$-86.01 =$	$\sqrt{\quad^2+}$
240°	$\sqrt{(75+1.29-3.74)^2+(35+0.37-1.56)^2+(23.4-3.60-1.82)^2}$	$-86.01 =$	$\sqrt{\quad^2+}$
270°	$\sqrt{(75+0.99-4.59)^2+(35+0.21-1.80)^2+(23.4+0.18-5.37)^2}$	$-86.01 =$	$\sqrt{\quad^2+}$
300°	$\sqrt{(75+0.33-4.13)^2+(35+0.00-1.56)^2+(23.4+3.93-7.43)^2}$	$-86.01 =$	$\sqrt{\quad^2+}$
330°	$\sqrt{(75-0.36+2.60)^2+(35-0.22-0.90)^2+(23.4+6.62-2.59)^2}$	$-86.01 =$	$\sqrt{\quad^2+}$

MAX AMPLITUDE $\frac{5.28+5.10}{2} = 5.19$ FT ACCELERATION $\left(\frac{2\pi}{Tw}\right)^2 \times 5.19$ 2.05

22,500 DWT TANKER LOADED 60' WD $\chi = 20°$ TW - 0 SEC

0°	$\sqrt{(75-0.97-0.65)^2+(35-0.30-1.29)^2+(2.30+12.91-4.74)^2}$	$-82.80 =$	$\sqrt{\quad^2+}$
30°	$\sqrt{(75-1.31+1.51)^2+(35-0.36-1.08)^2+(2.30+10.01-0.95)^2}$	$-82.80 =$	$\sqrt{\quad^2+}$
60°	$\sqrt{(75-1.30+2.26)^2+(35-0.31-0.63)^2+(2.30+9.92+3.10)^2}$	$-82.80 =$	$\sqrt{\quad^2+}$
90°	$\sqrt{(75-0.95+4.14)^2+(35-0.10-0.01)^2+(2.30-1.47+6.32)^2}$	$-82.80 =$	$\sqrt{\quad^2+}$
120	$\sqrt{(75-0.33+3.91)^2+(35+0.00+0.61)^2+(2.30-7.98+7.89)^2}$	$-82.80 =$	$\sqrt{\quad^2+}$
150°	$\sqrt{(75+0.36+2.63)^2+(35+0.17+1.06)^2+(2.30-11.48+7.26)^2}$	$-82.80 =$	$\sqrt{\quad^2+}$
180°	$\sqrt{(75+0.97+0.65)^2+(35+0.30+1.29)^2+(2.30-12.41+4.74)^2}$	$-82.80 =$	$\sqrt{\quad^2+}$
210°	$\sqrt{(75+1.31-1.51)^2+(35+0.36+1.08)^2+(2.30-10.01+0.95)^2}$	$-82.80 =$	$\sqrt{\quad^2+}$
240°	$\sqrt{(75+1.30-3.26)^2+(35+0.31+0.63)^2+(2.30-9.92-3.10)^2}$	$-82.80 =$	$\sqrt{\quad^2+}$
270°	$\sqrt{(75+0.95-4.14)^2+(35+0.10+0.01)^2+(2.30+1.47-6.32)^2}$	$-82.80 =$	$\sqrt{\quad^2+}$
300°	$\sqrt{(75+0.33-3.91)^2+(35+0.00+0.61)^2+(2.30+7.98-7.89)^2}$	$-82.80 =$	$\sqrt{\quad^2+}$
330	$\sqrt{(75-0.36-2.63)^2+(35-0.17-1.06)^2+(2.30+11.48-7.26)^2}$	$-82.80 =$	$\sqrt{\quad^2+}$

MAX AMPLITUDE $\frac{3.51+3.51}{2} = 3.51$ ACCELERATION $\left(\frac{2\pi}{Tw}\right)^2 \times 3.5$ 1.38

66

Tw - 0 SEC

01 = $\sqrt{\quad^2 + 34.62^2 + 25.28^2}$ − 86.01 = $\sqrt{7,263.42}$ − 86.01 = 85.23 − 86.01 = − 0.78

N = $\sqrt{\quad^2 + 35.46^2 + 22.62^2}$ − 86.01 = $\sqrt{7,741.83}$ − 86.01 = 87.92 − 86.01 = + 1.38

N = $\sqrt{\quad^2 + 36.19^2 + 18.87^2}$ − 86.01 = $\sqrt{8,133.81}$ − 86.01 = 90.22 − 86.01 = + 4.21

1 = $\sqrt{\quad^2 + 36.69^2 + 28.59^2}$ − 86.01 = $\sqrt{8,334.18}$ − 86.01 = 91.29 − 86.01 = + 5.28

0 = $\sqrt{\quad^2 + 36.51^2 + 26.38^2}$ − 86.01 = $\sqrt{8,272.92}$ − 86.01 = 90.96 − 86.01 = + 4.95

= $\sqrt{\quad^2 + 36.12^2 + 24.37^2}$ − 86.01 = $\sqrt{7,976.31}$ − 86.01 = 89.31 − 86.01 = + 3.30

= $\sqrt{\quad^2 + 35.38^2 + 21.52^2}$ − 86.01 = $\sqrt{7,542.65}$ − 86.01 = 86.85 − 86.01 = + 0.84

= $\sqrt{\quad^2 + 34.54^2 + 19.18^2}$ − 86.01 = $\sqrt{7,090.29}$ − 86.01 = 84.20 − 86.01 = − 1.81

= $\sqrt{\quad^2 + 33.81^2 + 17.98^2}$ − 86.01 = $\sqrt{6,729.30}$ − 86.01 = 82.04 − 86.01 = − 3.97

= $\sqrt{\quad^2 + 33.41^2 + 18.21^2}$ − 86.01 = $\sqrt{6,395.79}$ − 86.01 = 80.91 − 86.01 = − 5.10

= $\sqrt{\quad^2 + 33.44^2 + 19.89^2}$ − 86.01 = $\sqrt{6,581.30}$ − 86.01 = 81.13 − 86.01 = − 4.88

= $\sqrt{\quad^2 + 33.88^2 + 22.43^2}$ − 86.01 = $\sqrt{6,840.72}$ − 86.01 = 82.71 − 86.01 = − 3.30

5.19 2.05 FT/SEC² WAVE FORCE MOORING LOAD = 2.05 × 83.7 = 171.6 K

Tw - 0 SEC

$\sqrt{\quad^2 + 33.46^2 + 9.97^2}$ − 82.80 = $\sqrt{6,603.60}$ − 82.80 = 81.26 − 82.80 = − 1.54

$\sqrt{\quad^2 + 33.56^2 + 11.36^2}$ − 82.80 = $\sqrt{6,910.36}$ − 82.80 = 83.13 − 82.80 = + 1.33

$\sqrt{\quad^2 + 34.06^2 + 10.32^2}$ − 82.80 = $\sqrt{7,185.43}$ − 82.80 = 84.79 − 82.80 = + 1.99

$\sqrt{\quad^2 + 34.89^2 + 7.16^2}$ − 82.80 = $\sqrt{7,382.11}$ − 82.80 = 85.92 − 82.80 = + 3.12

$\sqrt{\quad^2 + 35.61^2 + 2.66^2}$ − 82.80 = $\sqrt{7,449.56}$ − 82.80 = 86.31 − 82.80 = + 3.51

$\sqrt{\quad^2 + 36.28^2 + 1.92^2}$ − 82.80 = $\sqrt{7,398.74}$ − 82.80 = 86.02 − 82.80 = + 3.22

$\sqrt{\quad^2 + 35.54^2 + 5.37^2}$ − 82.80 = $\sqrt{7,239.63}$ − 82.80 = 85.06 − 82.80 = + 2.26

$\sqrt{\quad^2 + 34.44^2 + 6.76^2}$ − 82.80 = $\sqrt{6,968.61}$ − 82.80 = 83.48 − 82.80 = + 0.68

$\sqrt{\quad^2 + 35.34^2 + 5.72^2}$ − 82.80 = $\sqrt{6,659.24}$ − 82.80 = 81.60 − 82.80 = − 1.20

$\sqrt{\quad^2 + 35.11^2 + 2.55^2}$ − 82.80 = $\sqrt{6,395.89}$ − 82.80 = 79.97 − 82.80 = − 2.83

$\sqrt{\quad^2 + 34.39^2 + 1.94^2}$ − 82.80 = $\sqrt{6,287.25}$ − 82.80 = 79.29 − 82.80 = − 3.51

$\sqrt{\quad^2 + 33.77^2 + 6.52^2}$ − 82.80 = $\sqrt{6,368.36}$ − 82.80 = 79.80 − 82.80 = − 3.00

3.5 1.38 FT/SEC² WAVE FORCE MOORING LOAD = 1.38 × 83.7 = 115.5 K

2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER NdB	CHECKED BY	DATE 4-15-66

70,000 DWT TANKER 60'WD $\chi = 10°$ Tw - 12 SEC

LIGHT

0°	-0.16 -1.16 =	-1.32
30°	-0.19 -1.06 =	-1.25
60°	-0.17 -0.67 =	-0.84
90°	-0.10 -0.10 =	-0.20
120°	0.00 +0.50 =	+0.50
150°	0.09 +0.96 =	+1.05

MAX AMPLITUDE = 1.32

ACCELERATION = $\left(\frac{2\pi}{Tw}\right)^2 \times 1.32 = 0.36$

FENDER FORCE 0.36 x 83.7 = 30.1 K

LOADED

	-0.13 -0.30 =	-0.43
	-0.16 -0.02 =	-0.18
	-0.14 +0.26 =	+0.12
	-0.09 +0.47 =	+0.38
	-0.01 +0.56 =	+0.55
	+0.06 +0.50 =	+0.56

MAX AMPLITUDE = 0.56

ACCELERATION = $\left(\frac{2\pi}{Tw}\right)^2 \times 0.56 = 0.15$

FENDER FORCE = 0.15 x 83.7 = 12.6 K

70,000 DWT TANKER 150'WD $\chi = 10°$ Tw = 17 SEC

LIGHT

	-0.16 +0.72 =	+0.56
	-0.19 +0.89 =	+0.70
	-0.17 +0.81 =	+0.64
	-0.10 +0.52 =	+0.42
	0.00 +0.09 =	+0.09
	+0.09 -0.36 =	-0.27

MAX AMPLITUDE = 0.70

ACCELERATION = $\left(\frac{2\pi}{Tw}\right)^2 \times 0.70 = 0.19$

FENDER FORCE .0.19 x 84.3 = 16.0 K

LOADED

	-0.13 -0.38 =	-0.51
	-0.16 -0.07 =	-0.23
	-0.19 +0.26 =	+0.12
	-0.09 +0.52 =	+0.43
	-0.01 +0.65 =	+0.64
	+0.06 +0.59 =	+0.65

MAX AMPLITUDE = 0.65

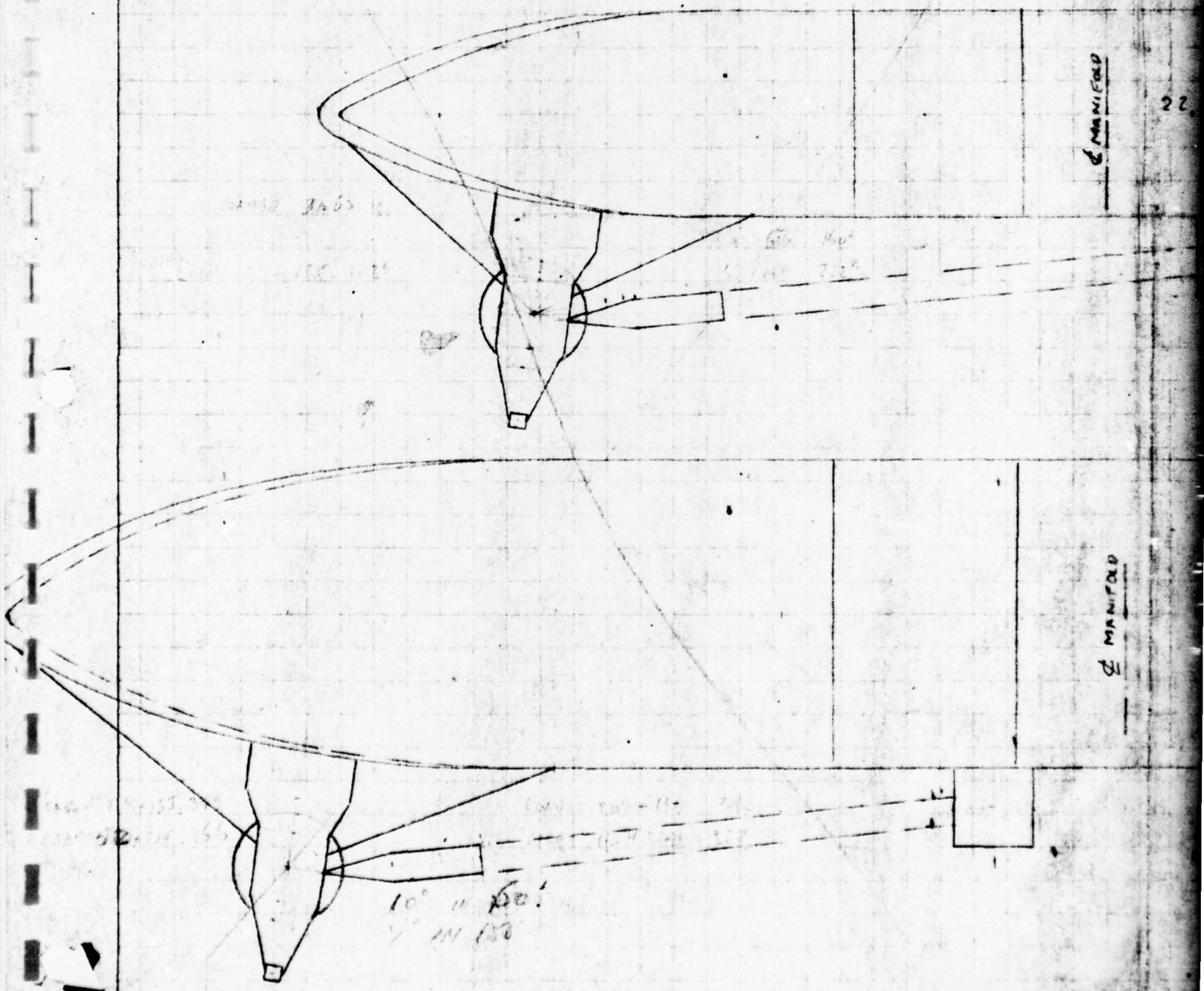
ACCELERATION = $\left(\frac{2\pi}{Tw}\right)^2 \times 0.65 = 0.18$

FENDER FORCE = 0.18 x 84.3 = 15.2 K

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE



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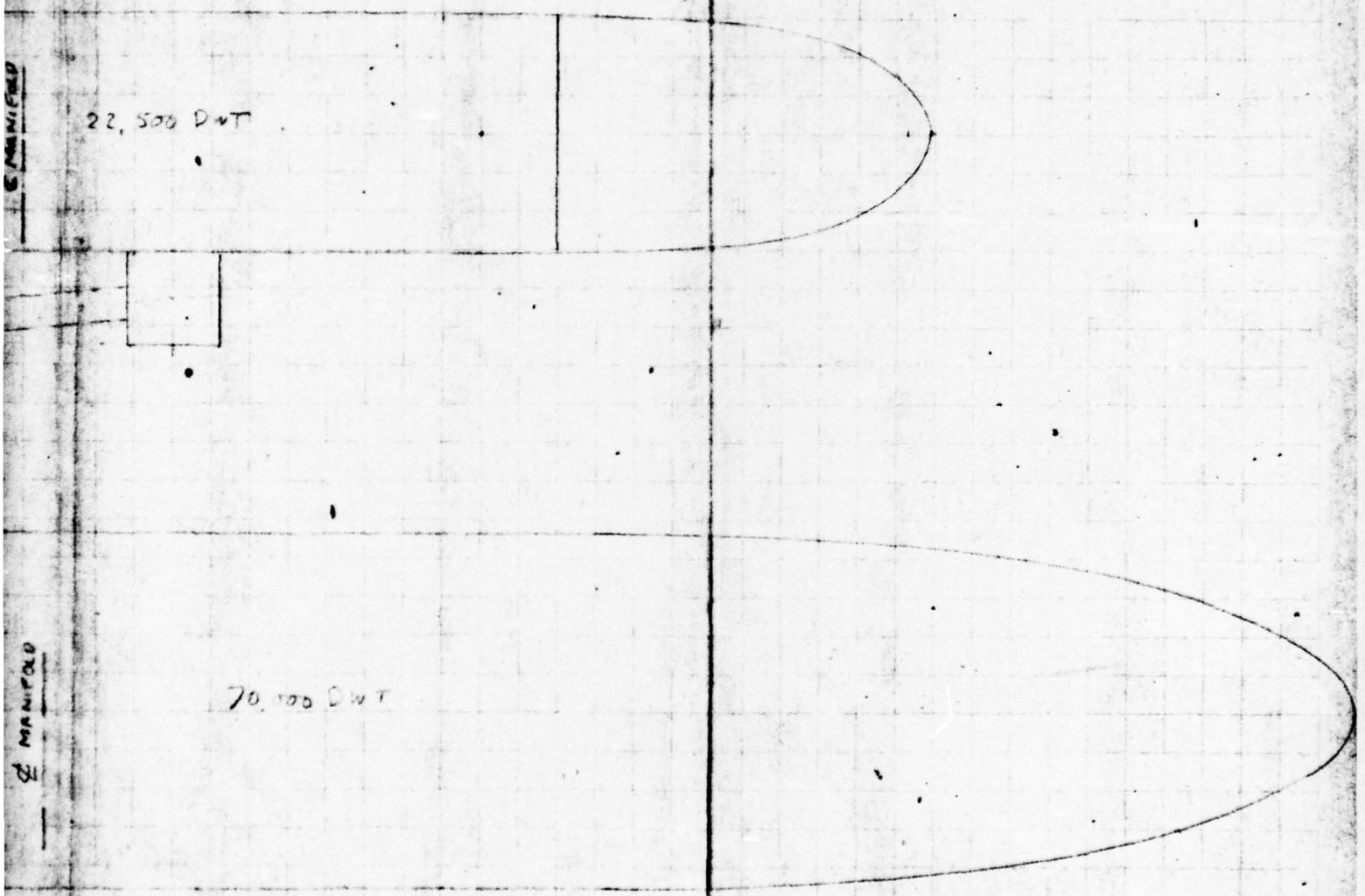


2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE
	N & B		4-18-66

22,600 DWT TANKER LIGHT 150' WD $\chi = 0.0°$ $T_N =$

0°	$\sqrt{(75-0.96-1.04)^2+(35.0-0.38-0.37)^2+(23.4+7.54-4.55)^2}$	$-86.01=$	$\sqrt{73.00^2+}$
30°	$\sqrt{(75-1.30+0.48)^2+(35.0-0.49+0.23)^2+(23.4+6.44-1.12)^2}$	$-86.01=$	$\sqrt{74.18^2+}$
60°	$\sqrt{(75-1.29+1.87)^2+(35.0-0.37+0.77)^2+(23.4+3.60+3.01)^2}$	$-86.01=$	$\sqrt{75.58^2+}$
90°	$\sqrt{(75-0.94+2.76)^2+(35.0-0.28+1.10)^2+(23.4-0.18+6.33)^2}$	$-86.01=$	$\sqrt{76.82^2+}$
120°	$\sqrt{(75-0.33+2.91)^2+(35.0+0.00+1.13)^2+(23.4-3.93+7.26)^2}$	$-86.01=$	$\sqrt{77.58^2+}$
150°	$\sqrt{(75+0.36+2.28)^2+(35.0+0.22+0.87)^2+(23.4-6.52+7.46)^2}$	$-86.01=$	$\sqrt{77.64^2+}$
180°	$\sqrt{(75+0.96+1.04)^2+(35.0+0.38+0.37)^2+(23.4-7.54+4.55)^2}$	$-86.01=$	$\sqrt{77.00^2+}$
210°	$\sqrt{(75+1.30-0.48)^2+(35.0+0.49-0.23)^2+(23.4-6.44+1.12)^2}$	$-86.01=$	$\sqrt{75.81^2+}$
240°	$\sqrt{(75+1.29-1.87)^2+(35.0+0.37-0.77)^2+(23.4-3.60+3.01)^2}$	$-86.01=$	$\sqrt{74.42^2+}$
270°	$\sqrt{(75+0.94-2.76)^2+(35.0+0.21-1.10)^2+(23.4+0.18-6.33)^2}$	$-86.01=$	$\sqrt{73.18^2+}$
300°	$\sqrt{(75+0.33-2.91)^2+(35.0+0.00-1.13)^2+(23.4+3.93-7.26)^2}$	$-86.01=$	$\sqrt{72.42^2+}$
330°	$\sqrt{(75-0.36-2.28)^2+(35.0-0.22-0.87)^2+(23.4+6.52-7.46)^2}$	$-86.01=$	$\sqrt{72.35^2+}$

MAX AMPLITUDE: $\frac{2.86+3.75}{2} = 3.31^{FT}$ ACCELERATION $= \left(\frac{2\pi}{T_N}\right)^2 \times 3.$ =

22,500 DWT TANKER LOADED 150' WD $\chi = 20°$ $T_N =$

0°	$\sqrt{(75-0.97-1.04)^2+(35.0-0.30-1.53)^2+(2.30+12.41-4.91)^2}$	$-82.80=$	$\sqrt{72.99^2+}$
30°	$\sqrt{(75-1.31+0.38)^2+(35.0-0.36-1.44)^2+(2.30+10.01-1.25)^2}$	$-82.80=$	$\sqrt{74.07^2+}$
60°	$\sqrt{(75-1.30+1.71)^2+(35.0-0.31-0.97)^2+(2.30+4.92+2.74)^2}$	$-82.80=$	$\sqrt{75.91^2+}$
90°	$\sqrt{(75-0.95+2.57)^2+(35.0-0.18-0.24)^2+(2.30-1.47+6.00)^2}$	$-82.80=$	$\sqrt{76.62^2+}$
120°	$\sqrt{(75-0.33+2.75)^2+(35.0+0.00+0.56)^2+(2.30-7.48+7.63)^2}$	$-82.80=$	$\sqrt{72.42^2+}$
150°	$\sqrt{(75+0.36+2.19)^2+(35.0+0.17+1.21)^2+(2.30-11.48+7.25)^2}$	$-82.80=$	$\sqrt{77.55^2+}$
180°	$\sqrt{(75+0.97+1.04)^2+(35.0+0.30+1.53)^2+(2.30-12.41+4.91)^2}$	$-82.80=$	$\sqrt{77.01^2+}$
210°	$\sqrt{(75+1.31-0.38)^2+(35.0+0.36+1.44)^2+(2.30-10.01+1.25)^2}$	$-82.80=$	$\sqrt{75.93^2+}$
240°	$\sqrt{(75+1.30-1.71)^2+(35.0+0.31+0.97)^2+(2.30-4.92-2.74)^2}$	$-82.80=$	$\sqrt{74.59^2+}$
270°	$\sqrt{(75+0.95-2.57)^2+(35.0+0.18+0.24)^2+(2.30+1.47-6.00)^2}$	$-82.80=$	$\sqrt{73.38^2+}$
300°	$\sqrt{(75+0.33-2.75)^2+(35.0+0.00-0.56)^2+(2.30+7.48-7.63)^2}$	$-82.80=$	$\sqrt{72.58^2+}$
330°	$\sqrt{(75-0.36-2.19)^2+(35.0-0.17-1.21)^2+(2.30+11.48-7.25)^2}$	$-82.80=$	$\sqrt{72.45^2+}$

MAX AMPLITUDE $= \frac{2.88+2.66}{2} = 2.77$ ACCELERATION $= \left(\frac{2\pi}{T_N}\right)^2 \times 2$

66

T_w = 10 SEC

$\sqrt{\quad + 25.33^2}$ − 86.01 =	$\sqrt{7,172.54}$ − 86.01 =	9.72 − 86.01 =	− 1.29
$18^2 + 34.09^2 + 28.72^2$ − 86.01 =	$\sqrt{7,537.85}$ − 86.01 =	6.82 − 86.01 =	+ 0.81
$58^2 + 35.80^2 + 30.01^2$ − 86.01 =	$\sqrt{7,166.10}$ − 86.01 =	8.62 − 86.01 =	+ 2.68
$82^2 + 33.\quad^2 + 28.55^2$ − 86.01 =	$\sqrt{8,062.61}$ − 86.01 =	9.79 − 86.01 =	+ 3.78
$58^2 + 36.\quad^2 + 27.43^2$ − 86.01 =	$\sqrt{8,054.44}$ − 86.01 =	8.97 − 86.01 =	+ 3.86
$64^2 + 36.\quad^2 + 29.29^2$ − 86.01 =	$\sqrt{7,918.04}$ − 86.01 =	8.98 − 86.01 =	+ 2.97
$05^2 + 35.\quad^2 + 20.81^2$ − 86.01 =	$\sqrt{7,690.12}$ − 86.01 =	7.41 − 86.01 =	+ 1.40
$87^2 + 32.\quad^2 + 18.08^2$ − 86.01 =	$\sqrt{7,315.20}$ − 86.01 =	8.53 − 86.01 =	− 0.48
$72^2 + 36.\quad^2 + 16.79^2$ − 86.01 =	$\sqrt{7,217.90}$ − 86.01 =	8.77 − 86.01 =	− 2.29
$18^2 + 34.\quad^2 + 17.25^2$ − 86.01 =	$\sqrt{8,816.37}$ − 86.01 =	5.56 − 86.01 =	− 3.95
$72^2 + 32.\quad^2 + 19.37^2$ − 86.01 =	$\sqrt{6,767.03}$ − 86.01 =	8.26 − 86.01 =	− 3.75
$16^2 + 32.\quad^2 + 22.56^2$ − 86.01 =	$\sqrt{6,854.81}$ − 86.01 =	8.03 − 86.01 =	− 2.98

$\sqrt{\quad} \times 3.\quad = 1.50$ FT/SEC^2 WAVE FORCE MOORING LOAD: $1.50 \times 84.3 = 126.5^K$

T_w = 0 SEC

$99^2 + 33.\quad^2 + 9.80^2$ − 82.80 =	$\sqrt{6,523.85}$ − 82.80 =	0.77 − 82.80 =	− 2.03
$07^2 + 33.\quad^2 + 11.08^2$ − 82.80 =	$\sqrt{6,710.33}$ − 82.80 =	1.92 − 82.80 =	− 0.88
$11^2 + 33.\quad^2 + 9.96^2$ − 82.80 =	$\sqrt{6,922.91}$ − 82.80 =	3.20 − 82.80 =	+ 5.40
$12^2 + 34.\quad^2 + 6.83^2$ − 82.80 =	$\sqrt{7,113.05}$ − 82.80 =	8.34 − 82.80 =	+ 1.54
$12^2 + 35.\quad^2 + 2.47^2$ − 82.80 =	$\sqrt{7,264.47}$ − 82.80 =	8.33 − 82.80 =	+ 2.43
$15^2 + 36.\quad^2 + 1.98^2$ − 82.80 =	$\sqrt{7,341.23}$ − 82.80 =	8.68 − 82.80 =	+ 2.88
$01^2 + 36.\quad^2 + 5.20^2$ − 82.80 =	$\sqrt{7,314.03}$ − 82.80 =	8.52 − 82.80 =	+ 2.72
$13^2 + 36.\quad^2 + 6.16^2$ − 82.80 =	$\sqrt{7,161.54}$ − 82.80 =	8.62 − 82.80 =	+ 1.82
$09^2 + 36.\quad^2 + 5.36^2$ − 82.80 =	$\sqrt{6,908.64}$ − 82.80 =	8.12 − 82.80 =	+ 0.32
$08^2 + 35.\quad^2 + 2.23^2$ − 82.80 =	$\sqrt{6,644.17}$ − 82.80 =	8.51 − 82.80 =	− 1.29
$81^2 + 34.\quad^2 + 2.13^2$ − 82.80 =	$\sqrt{6,438.51}$ − 82.80 =	80.36 − 82.80 =	− 2.44
$15^2 + 33.\quad^2 + 6.53^2$ − 82.80 =	$\sqrt{6,921.35}$ − 82.80 =	80.14 − 82.80 =	− 2.66

$\left(\frac{2\pi}{T_w}\right) \times 2.77 = 1.09$ FT/SEC^2 WAVE FORCE MOORING LOAD = $1.09 \times 84.3 = 91.9^K$

2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY		SHEET NO
SUBJECT		
DRAWING NUMBER	COMPUTER NAB	CHECKED BY	DATE 4-20-66

22,500 DWT TANKER 60' WD $\chi = 20°$ T_W = 10 SEC

	LIGHT	LOADED
0°	−0.38	−1.59
30°	+0.46	−1.44
60°	+1.19	−0.94
90°	+1.59	−0.11
120°	+1.56	+0.61
150°	+1.12	+1.23
	MAX AMPL 1.59'	MAX AMPL 1.59'

ACC. $\left(\frac{2\pi}{T_W}\right)^2 \times 1.59 = 0.63$ F/SEC²

FENDER LOAD = 0.63 × 83.7 = 52.7ᴷ

ACC. $\left(\frac{2\pi}{T_W}\right)^2 \times 1.59 = 0.61$ F/SEC²

FENDER LOAD = 0.61 × 83.7 = 51.1ᴷ

22,500 DWT TANKER 150' WD $\chi = 20°$ T_W = 10 SEC

	LIGHT	LOADED
0°	−0.75	−1.83
30°	−0.21	−1.80
60°	+0.40	−1.28
90°	+0.89	−0.42
120°	+1.13	+0.56
150°	+1.19	+1.38
	MAX AMPL = 1.19	MAX AMPL = 1.83'

ACC. $\left(\frac{2\pi}{T_W}\right)^2 \times 1.19 = 0.47$ F/SEC²

FENDER LOAD = 0.47 × 84.3 = 39.6ᴷ

ACC. $\left(\frac{2\pi}{T_W}\right)^2 \times 1.83 = 0.72$ F/SEC²

FENDER LOAD = 0.72 × 84.3 = 60.7ᴷ

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE
	NdB		4-18-66

70,000 DWT TANKER LIGHT 60' WD $\chi = 20°$ $T_N = 12$

0°	$\sqrt{(100-0.92-4.08)^2+(35-0.38-1.51)^2+(36.60+7.02-2.63)^2} - 112.09 =$	$\sqrt{95.00^2}$	
30°	$\sqrt{(100-1.25-3.76)^2+(35-0.43-1.50)^2+(36.60+6.22+1.52)^2} - 112.09 =$	$\sqrt{94.99^2+33.$	$+49.$
60°	$\sqrt{(100-1.25-2.43)^2+(35-0.36-1.02)^2+(36.60+3.76+5.25)^2} - 112.09 =$	$\sqrt{96.32^2+33.6}$	$+45.6$
90°	$\sqrt{(100-0.91-0.45)^2+(35-0.20-0.27)^2+(36.60+0.28+7.58)^2} - 112.09 =$	$\sqrt{98.64^2+34.5}$	$+44.96$
120°	$\sqrt{(100-0.32+1.64)^2+(35+0.01+0.56)^2+(36.60-3.26+7.88)^2} - 112.09 =$	$\sqrt{101.32^2+35.5}$	$+41.22$
150°	$\sqrt{(100+0.34+3.30)^2+(35+0.23+1.24)^2+(36.60-5.93+6.07)^2} - 112.09 =$	$\sqrt{103.64^2+36.4}$	$+36.74$
180°	$\sqrt{(100+0.92+4.08)^2+(35+0.38+1.58)^2+(36.60-7.02+2.63)^2} - 112.09 =$	$\sqrt{105.05^2+36.36}$	32.21
210°	$\sqrt{(100+1.25+3.76)^2+(35+0.43+1.50)^2+(36.60-6.22-1.52)^2} - 112.09 =$	$\sqrt{105.01^2+36.93}$	28.86
240°	$\sqrt{(100+1.25+2.43)^2+(35+0.36+1.02)^2+(36.60-3.76-5.25)^2} - 112.09 =$	$\sqrt{103.68^2+36.38^2}$	27.59^2
270°	$\sqrt{(100+0.91+0.45)^2+(35+0.20+0.27)^2+(36.60-0.28-7.58)^2} - 112.09 =$	$\sqrt{101.35^2+35.47^2}$	28.24^2
300°	$\sqrt{(100+0.32-1.64)^2+(35-0.01-0.56)^2+(36.60+3.26-7.88)^2} - 112.09 =$	$\sqrt{98.68^2+34.43^2}$	31.98^2
330°	$\sqrt{(100-0.34-3.30)^2+(35-0.23-1.24)^2+(36.60+5.93-6.07)^2} - 112.09 =$	$\sqrt{96.36^2+33.53^2}$	26.96^2

MAX AMPLITUDE. $\frac{3.79+3.74}{2} = 3.77'$ ACCELERATION $= \left(\frac{2\pi}{T_N}\right)^2 \times 3.77$ 1.03

70,000 DWT TANKER LOADED 60' WD $\chi = 20°$ T_N 12 S

0°	$\sqrt{(100-0.93-4.50)^2+(35-0.31-0.90)^2+(8.0+11.97-2.75)^2} - 106.25 =$	$\sqrt{94.57^2+33.7}$	$+17.2$
30°	$\sqrt{(100-1.27-4.36)^2+(35-0.35-0.73)^2+(8.0+9.57+1.34)^2} - 106.25 =$	$\sqrt{94.57^2+33.9}$	$+18.21$
60°	$\sqrt{(100-1.26-3.05)^2+(35-0.31-0.37)^2+(8.0+4.61+5.07)^2} - 106.25 =$	$\sqrt{95.69^2+34.32}$	$+17.68$
90°	$\sqrt{(100-0.91-0.93)^2+(35-0.18+0.09)^2+(8.0-1.50+7.44)^2} - 106.25 =$	$\sqrt{98.16^2+34.91}$	$+13.85$
120°	$\sqrt{(100-0.32+1.95)^2+(35+0.00+0.53)^2+(8.0-7.36+7.82)^2} - 106.25 =$	$\sqrt{101.13^2+35.53}$	$+8.46$
150°	$\sqrt{(100+0.35+3.43)^2+(35+0.17+0.82)^2+(8.0-11.16+6.10)^2} - 106.25 =$	$\sqrt{103.78^2+35.99}$	$+2.94$
180°	$\sqrt{(100+0.93+4.50)^2+(35+0.31+0.90)^2+(8.0-11.97+2.75)^2} - 106.25 =$	$\sqrt{105.43^2+36.21}$	$+1.22$
210°	$\sqrt{(100+1.27+4.36)^2+(35+0.35+0.73)^2+(8.0-9.57-1.34)^2} - 106.25 =$	$\sqrt{105.63^2+36.06}$	$+2.91$
240°	$\sqrt{(100+1.26+3.05)^2+(35+0.31+0.37)^2+(8.0-4.61-5.07)^2} - 106.25 =$	$\sqrt{104.31^2+35.68}$	$+1.68$
270°	$\sqrt{(100+0.91+0.93)^2+(35+0.18-0.09)^2+(8.0+1.50-7.44)^2} - 106.25 =$	$\sqrt{101.89^2+35.09}$	$+2.15$
300°	$\sqrt{(100+0.32-1.95)^2+(35+0.00-0.53)^2+(8.0+7.36-7.82)^2} - 106.25 =$	$\sqrt{98.87^2+34.47}$	7.57
330°	$\sqrt{(100-0.35-3.43)^2+(35+0.17-0.82)^2+(8.0+11.16-6.10)^2} - 106.25 =$	$\sqrt{96.22^2+34.01}$	13.06

MAX AMPLITUDE. $\frac{4.36+5.41}{2} = 4.89$ FT ACCELERATION $\left(\frac{2\pi}{T_N}\right)^2 \times 9 = 1$

66

T_w = 12 SEC

09 =	$\sqrt{35.00^2 + 33.04^2 + 40.39^2} - 112.09 = \sqrt{11,796.82} - 112.09 = 108.61 - 112.09 =$			− 3.48
$9^2 + 33.$	$+ 44.34^2 - 112.09 = \sqrt{12,082.76} - 112.09 = 109.9? - 112.09 =$			− 2.17
$^2 + 33.6$	$+ 45.61^2 - 112.09 = \sqrt{12,488.12} - 112.09 = 111.75 - 112.09 =$			− 0.34
$^2 + 34.5$	$+ 44.96^2 - 112.09 = \sqrt{12,898.85} - 112.09 = 113.51 - 112.09 =$			+ 1.48
$^2 + 35.5$	$+ 41.22^2 - 112.09 = \sqrt{13,230.05} - 112.09 = 115.02 - 112.09 =$			+ 2.93
$^2 + 36.4$	$+ 36.74^2 - 112.09 = \sqrt{13,421.14} - 112.09 = 115.85 - 112.09 =$			+ 3.76
$^2 + 36.56$	$32.21^2 - 112.09 = \sqrt{13,428.53} - 112.09 = 115.88 - 112.09 =$			+ 3.79
$+ 36.53$	$28.86^2 - 112.09 = \sqrt{13,223.82} - 112.09 = 114.99 - 112.09 =$			+ 2.90
$+ 36.38^2$	$27.09^2 - 112.09 = \sqrt{13,839.25} - 112.09 = 113.29 - 112.09 =$			+ 1.20
$+ 35.47^2$	$28.24^2 - 112.09 = \sqrt{12,357.96} - 112.09 = 111.17 - 112.09 =$			− 0.92
$+ 34.43^2$	$31.98^2 - 112.09 = \sqrt{11,795.89} - 112.09 = 109.30 - 112.09 =$			− 2.79
$+ 33.53$	$36.96^2 - 112.09 = \sqrt{11,708.84} - 112.09 = 108.35 - 112.09 =$			− 3.74

3.77 $1.03^{FT/SEC^2}$ WAVE FORCE MOORING LOAD = $1.03 \times 83.7 = 86.2^K$

T_w 12 SEC

$^2 + 33.7$	$+ 17.22^2 - 106.25 = \sqrt{10,381.78} - 106.25 = 101.89 - 106.25 =$			− 4.36
$+ 33.9$	$+ 19.21^2 - 106.25 = \sqrt{10,413.85} - 106.25 = 102.05 - 106.25 =$			− 4.20
$+ 34.32$	$+ 17.68^2 - 106.25 = \sqrt{10,697.02} - 106.25 = 103.18 - 106.25 =$			− 3.07
$+ 34.91$	$+ 13.85^2 - 106.25 = \sqrt{11,547.32} - 106.25 = 105.11 - 106.25 =$			− 1.14
$+ 35.53$	$+ 8.46^2 - 106.25 = \sqrt{11,561.23} - 106.25 = 107.52 - 106.25 =$			+ 1.27
$+ 35.99$	$+ 2.94^2 - 106.25 = \sqrt{11,974.21} - 106.25 = 109.38 - 106.25 =$			+ 3.63
$+ 36.21$	$+ 1.22^2 - 106.25 = \sqrt{12,428.14} - 106.25 = 111.48 - 106.25 =$			+ 5.23
$+ 36.08$	$2.91^2 - 106.25 = \sqrt{12,467.93} - 106.25 = 111.66 - 106.25 =$			+ 5.41
$+ 35.68$	$1.68^2 - 106.25 = \sqrt{12,156.96} - 106.25 = 110.26 - 106.25 =$			+ 4.01
$+ 35.09$	$2.15^2 - 106.25 = \sqrt{11,607.32} - 106.25 = 107.74 - 106.25 =$			+ 1.49
$+ 34.47$	$7.59^2 - 106.25 = \sqrt{11,020.31} - 106.25 = 104.98 - 106.25 =$			− 1.27
$+ 34.01^2$	$13.06^2 + 106.25 = \sqrt{10,585.53} - 106.25 = 102.80 - 106.25 =$			− 3.36

$(\frac{2\pi}{T})^2 \times 9 = 1.34^{FT/SEC^2}$ WAVE FORCE MOORING LOAD = $1.34 \times 83.7 = 112.2^K$

2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
McD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY | SHEET NO

SUBJECT

DRAWING NUMBER | COMPUTER: N dB | CHECKED BY | DATE: 4-18-66

70,000 DWT TANKER LIGHT 150' WD $\chi = 20$

0°	$\sqrt{(100-0.92-4.92)^2+(35-0.28-1.83)^2+(36.60+7.02-2.86)^2} = 112.09$	$=\sqrt{91.16^2+32.79^2+40.76^2} = 10$	$=\sqrt{$
30°	$\sqrt{(100-0.25-5.16)^2+(35-0.93-2.06)^2+(36.60+6.22+1.27)^2} = 112.09$	$=\sqrt{93.59^2+32.51^2+44.05^2} = 11$	$=\sqrt{$
60°	$\sqrt{(100-1.25-4.03)^2+(35-0.36-1.74)^2+(36.60+3.76+5.05)^2} = 112.09$	$=\sqrt{94.72^2+32.90^2+45.41^2} = 11$	$=\sqrt{$
90°	$\sqrt{(100-0.91-1.81)^2+(35-0.20-0.95)^2+(36.60+0.28+7.41)^2} = 117.09$	$=\sqrt{97.28^2+33.85^2+44.36^2} = 11$	$=\sqrt{$
120°	$\sqrt{(100-0.32+0.89)^2+(35+0.01+2.03)^2+(36.60-3.26+7.90)^2} = 112.09$	$=\sqrt{100.57^2+35.10^2+41.29^2} = 11$	$=\sqrt{$
150°	$\sqrt{(100+0.34+3.35)^2+(35+0.23+1.11)^2+(36.60-5.93+6.21)^2} = 112.09$	$=\sqrt{103.65^2+36.34^2+36.88^2} = 11$	$=\sqrt{$
180°	$\sqrt{(100+0.92+4.92)^2+(35+0.28+1.83)^2+(36.60-7.02+2.86)^2} = 112.09$	$=\sqrt{105.84^2+37.21^2+32.49^2} = 11$	$=\sqrt{$
210°	$\sqrt{(100+1.25+5.16)^2+(35+0.93+2.06)^2+(36.60-6.22-1.27)^2} = 112.09$	$=\sqrt{106.41^2+37.93^2+29.11^2} = 11$	$=\sqrt{$
240°	$\sqrt{(100+1.25+4.03)^2+(35+0.36+1.74)^2+(36.60-3.76-5.05)^2} = 112.09$	$=\sqrt{105.28^2+37.10^2+27.79^2} = 11$	$=\sqrt{$
270°	$\sqrt{(100+0.91+1.81)^2+(35+0.20+0.95)^2+(36.60-0.28-7.41)^2} = 112.09$	$=\sqrt{102.72^2+36.15^2+28.84^2} = 11$	$=\sqrt{$
300°	$\sqrt{(100+0.32-0.89)^2+(35-0.01-0.09)^2+(36.60+3.26-7.90)^2} = 119.09$	$=\sqrt{99.93^2+34.90^2+31.96^2} = 11$	$=\sqrt{$
330°	$\sqrt{(100-0.34-3.35)^2+(35-0.23-1.11)^2+(36.60+5.93-6.21)^2} = 112.09$	$=\sqrt{96.31^2+33.66^2+36.32^2} = 11$	$=\sqrt{$

MAX AMPLITUDE $\frac{4.37+4.20}{2} = 4.54$ FT ACCELERATION $\left(\frac{2\pi}{T_N}\right)^2 \times 4.54 = 1.$

70,000 DWT TANKER LOADED 150' WD $\chi = 20°$ T

0°	$\sqrt{(100-0.93-5.02)^2+(35-0.31-0.92)^2+(8.0+11.97-2.94)^2} = 106.25$	$=\sqrt{94.03^2+33.77^2+17.03^2} = 10$	$=\sqrt{$
30°	$\sqrt{(100-1.27-5.84)^2+(35-0.35-0.75)^2+(8.0+9.57+1.16)^2} = 106.25$	$=\sqrt{92.89^2+33.30^2+18.73^2} = 10$	$=\sqrt{$
60°	$\sqrt{(100-1.26-5.10)^2+(35-0.31-0.38)^2+(8.0+4.61+4.94)^2} = 106.25$	$=\sqrt{93.64^2+34.31^2+17.55^2} = 10$	$=\sqrt{$
90°	$\sqrt{(100-0.91-2.99)^2+(35-0.18+0.09)^2+(8.0-1.59+7.41)^2} = 106.25$	$=\sqrt{96.10^2+34.91^2+13.82^2} = 10$	$=\sqrt{$
120°	$\sqrt{(100-0.32-0.88)^2+(35+0.00+0.54)^2+(8.0-7.36+7.88)^2} = 106.25$	$=\sqrt{99.60^2+35.54^2+8.52^2} = 10$	$=\sqrt{$
150°	$\sqrt{(100+0.35+2.85)^2+(35+0.17+0.84)^2+(8.0-11.16+6.25)^2} = 106.25$	$=\sqrt{103.20^2+36.01^2+3.09^2} = 10$	$=\sqrt{$
180°	$\sqrt{(100+0.93+5.02)^2+(35+0.31+0.92)^2+(8.0-11.97+2.94)^2} = 106.25$	$=\sqrt{105.95^2+36.23^2+-1.03^2} = 10$	$=\sqrt{$
210°	$\sqrt{(100+1.27+5.84)^2+(35+0.35+0.75)^2+(8.0-9.57-1.16)^2} = 106.25$	$=\sqrt{107.11^2+36.10^2+-2.73^2} = 10$	$=\sqrt{$
240°	$\sqrt{(100+1.26+5.10)^2+(35+0.31+0.38)^2+(8.0-4.61-4.94)^2} = 106.25$	$=\sqrt{106.36^2+35.69^2+-1.55^2} = 10$	$=\sqrt{$
270°	$\sqrt{(100+0.91+2.99)^2+(35+0.18-0.09)^2+(8.0+1.59-7.41)^2} = 106.25$	$=\sqrt{103.90^2+35.09^2+2.18^2} = 10$	$=\sqrt{$
300°	$\sqrt{(100+0.32+0.88)^2+(35+0.00-0.54)^2+(8.0+7.36-7.88)^2} = 106.25$	$=\sqrt{100.40^2+34.96^2+7.98^2} = 10$	$=\sqrt{$
330°	$\sqrt{(100-0.35-2.85)^2+(35-0.17-0.84)^2+(8.0+11.16-6.25)^2} = 106.25$	$=\sqrt{96.80^2+33.99^2+12.91^2} = 10$	$=\sqrt{$

MAX AMPLITUDE $\frac{5.61+5.73}{2} = 5.67$ FT ACCELERATION $= \left(\frac{2\pi}{T_N}\right)^2 \times 5.67 =$

$\chi = 20°$ $T_W = 12$ SEC

$\sqrt{11,602.67} - 112.09 = 107.72 - 112.09 = -4.37$

$\sqrt{11,759.92} - 112.09 = 108.49 - 112.09 = -3.65$

$\sqrt{12,116.36} - 112.09 = 110.07 - 112.09 = -2.02$

$\sqrt{12,577.03} - 112.09 = 112.15 - 112.09 = +0.06$

$\sqrt{14,047.07} - 112.09 = 119.22 - 112.09 = +2.13$

$\sqrt{13,432.35} - 112.09 = 115.90 - 112.09 = +3.81$

$\sqrt{13,639.04} - 112.09 = 116.79 - 112.09 = +4.70$

$\sqrt{13,575.98} - 112.09 = 116.52 - 112.09 = +4.43$

$\sqrt{13,232.57} - 112.09 = 115.03 - 112.09 = +2.94$

$\sqrt{12,669.97} - 112.09 = 112.65 - 112.09 = +0.56$

$\sqrt{12,125.78} - 112.09 = 110.12 - 112.09 = -1.97$

$\sqrt{11,727.75} - 112.09 = 108.29 - 112.09 = -3.80$

$\times 4.91 = 1.24^{FT/SEC}$ WAVE FORCE. MOVING LOAD $1.24 \times 84.3 = 104.5^{K}$

$\chi = 20°$ $T_W = 12$ SEC

$\sqrt{10,275.84} - 106.25 = 101.37 - 106.25 = -4.88$

$\sqrt{10,126.58} - 106.25 = 100.64 - 106.25 = -5.61$

$\sqrt{10,253.63} - 106.25 = 101.26 - 106.25 = -4.99$

$\sqrt{10,694.31} - 106.25 = 103.17 - 106.25 = -3.08$

$\sqrt{11,255.84} - 106.25 = 106.09 - 106.25 = -0.16$

$\sqrt{11,956.51} - 106.25 = 109.35 - 106.25 = +3.10$

$\sqrt{12,535.08} - 106.25 = 111.98 - 106.25 = +5.73$

$\sqrt{12,783.22} - 106.25 = 113.06 - 106.25 = +6.81$

$\sqrt{12,588.63} - 106.25 = 112.20 - 106.25 = +5.95$

$\sqrt{12,031.27} - 106.25 = 109.69 - 106.25 = +3.44$

$\sqrt{11,323.60} - 106.25 = 106.41 - 106.25 = +0.16$

$\sqrt{10,692.23} - 106.25 = 103.40 - 106.25 = -3.01$

$\times 1.57 = 1.55^{FT/SEC}$ WAVE FORCE MOVING LOAD $1.55 \times 84.3 = 130.7^{K}$

2

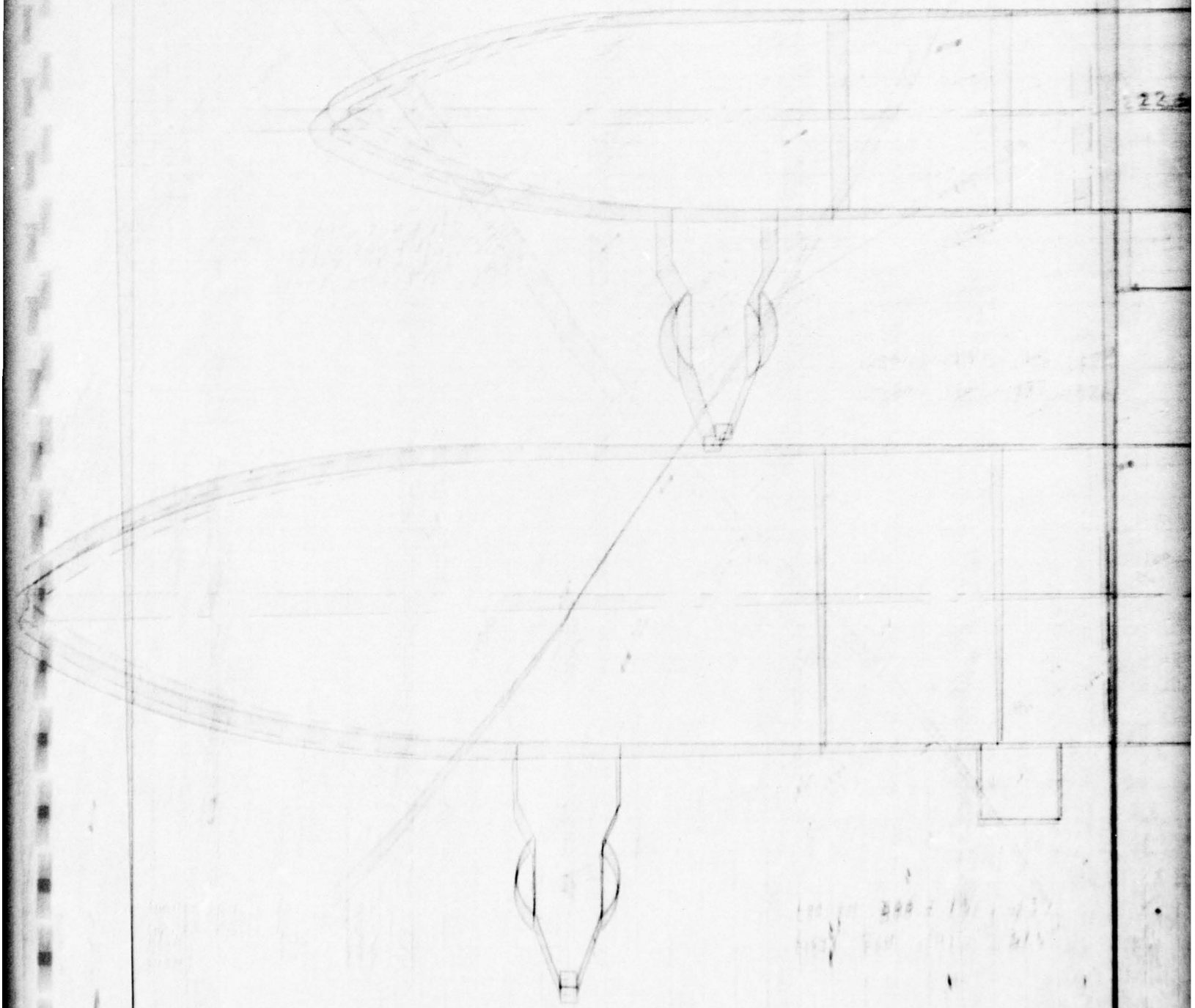
ENGINEERING DEPARTMENT

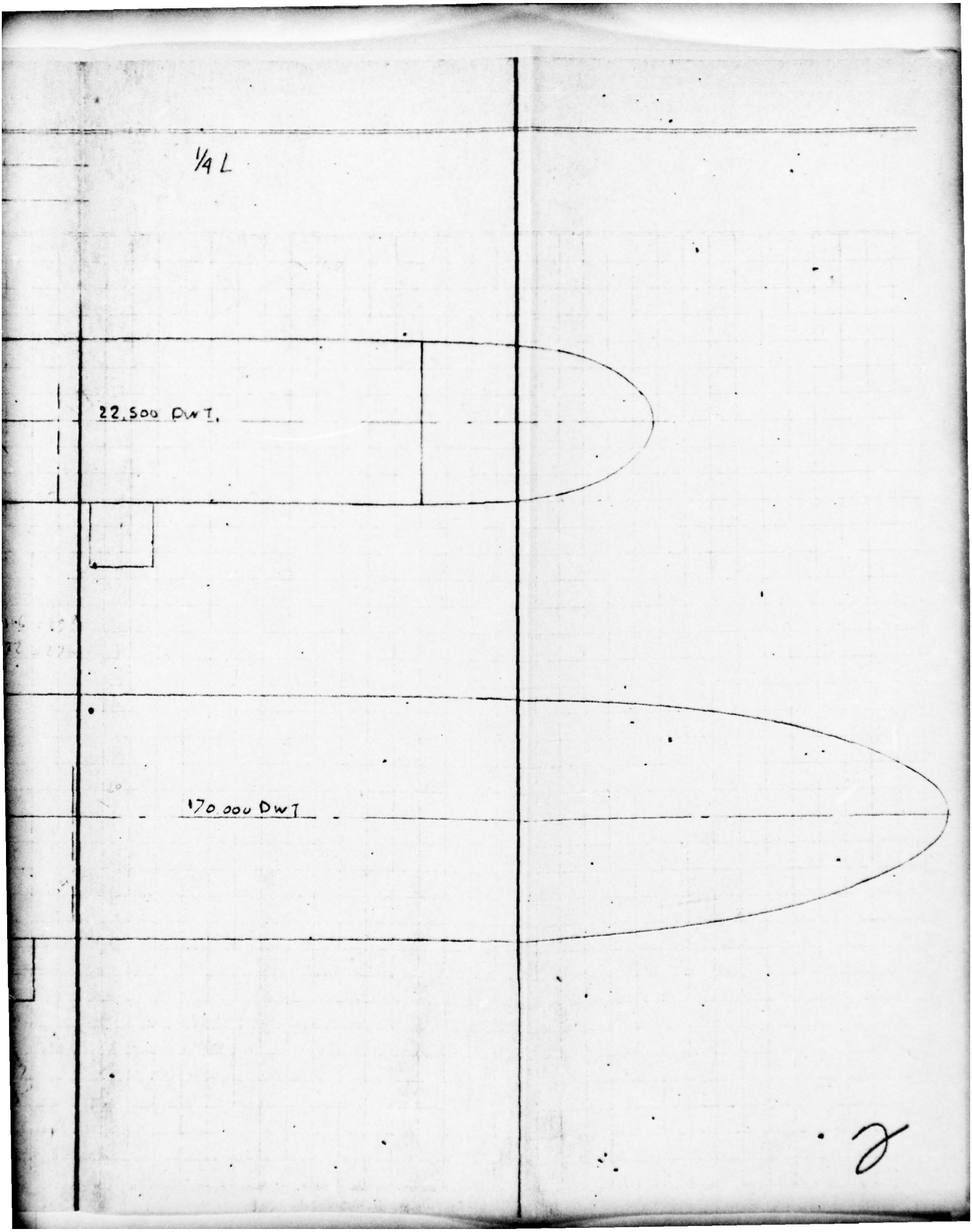
ENGINEERING DEPARTMENT

COMPUTATION SHEET

J. RAY McDERMOTT & CO., INC.

J. RAY McDERMOTT & CO., INC.




1/4 L
22,500 DWT.
170,000 DWT

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

70,000 DWT TANKER 60' WD X = 20' TW = 12 SEC

	LIGHT	LOADED
0°	−1.96	−1.21
30°	−1.93	−1.08
60°	−1.38	−0.68
90°	−0.47	−0.09
120°	+0.57	+0.53
150°	+1.47	+0.99

MAX AMPL. = 1.96
ACC. $= \left(\frac{2\pi}{Tw}\right)^2 \times 1.96 = 0.54$ FT/SEC²

FENDER LOAD = 0.54 × 83.7 = 45.2 K

MAX AMPL = 1.21
ACC. $= \left(\frac{2\pi}{Tw}\right)^2 \times 1.21 = 0.33$ FT/SEC²

FENDER LOAD = 0.33 × 83.7 = 27.6 K

70,000 DWT TANKER 150' WD X = 20' TW = 12 SEC

	LIGHT	LOADED
0°	−2.31	−1.23
30°	−2.09	−1.10
60°	−2.10	−0.69
90°	−1.15	−0.09
120°	+0.10	+0.54
150°	+1.34	+0.01

MAX AMPL. 2.31
ACC. $= \left(\frac{2\pi}{Tw}\right)^2 \times 2.31 = 0.63$ FT/SEC²

FENDER LOAD = 0.63 × 84.3 = 53.1 K

MAX AMPL 1.23
ACC. $= \left(\frac{2\pi}{Tw}\right)^2 \times 1.23 = 0.34$ FT/SEC²

FENDER LOAD = 0.34 × 84.3 = 28.7 K

ENGINEERING DEPARTMENT
COMPUTATION SHEET
McD J 4003

J. RAY McDERMOTT & Co., INC.

COMPANY | SHEET NO

SUBJECT

DRAWING NUMBER | COMPUTER NdB | CHECKED BY | DATE 4-19-66

22,500 DWT TANKER LIGHT 60' WD $\chi = 30°$ T

0°	$\sqrt{(75-1.09+1.76)^2+(35-0.72-1.91)^2+(23.4+5.06-7.52)^2} - 86.01 =$	$\sqrt{75.67^2+32.37^2+20.91^2} - 86.01 =$	V
30°	$\sqrt{(75-1.47-1.27)^2+(35-0.79-1.14)^2+(23.4+5.37-7.16)^2} - 86.01 =$	$\sqrt{72.26^2+33.07^2+21.61^2} - 86.01 =$	V
60°	$\sqrt{(75-1.46-3.96)^2+(35-0.65-0.06)^2+(23.4+1.25-1.88)^2} - 86.01 =$	$\sqrt{69.58^2+34.29^2+22.72^2} - 86.01 =$	V
90°	$\sqrt{(75-1.05-5.53)^2+(35-0.33+1.03)^2+(23.4+1.98-1.29)^2} - 86.01 =$	$\sqrt{68.36^2+35.70^2+24.09^2} - 86.01 =$	V
120°	$\sqrt{(75-0.37-5.72)^2+(35+0.07+1.85)^2+(23.4-6.81+2.64)^2} - 86.01 =$	$\sqrt{68.91^2+36.92^2+25.23^2} - 86.01 =$	V
150°	$\sqrt{(75+0.41-4.32)^2+(35+0.46+2.17)^2+(23.4-3.39+5.87)^2} - 86.01 =$	$\sqrt{71.09^2+37.63^2+25.88^2} - 86.01 =$	V
180°	$\sqrt{(75+1.09-1.76)^2+(35+0.72+1.91)^2+(23.4-5.06+7.52)^2} - 86.01 =$	$\sqrt{74.33^2+37.63^2+25.86^2} - 86.01 =$	V
210°	$\sqrt{(75+1.47+1.27)^2+(35+0.79+1.14)^2+(23.4-5.37+7.16)^2} - 86.01 =$	$\sqrt{77.74^2+36.93^2+25.19^2} - 86.01 =$	V
240°	$\sqrt{(75+1.46+3.96)^2+(35+0.65+0.06)^2+(23.4-1.25+1.88)^2} - 86.01 =$	$\sqrt{80.42^2+35.71^2+24.03^2} - 86.01 =$	V
270°	$\sqrt{(75+1.05+5.53)^2+(35+0.33-1.03)^2+(23.4-1.98+1.29)^2} - 86.01 =$	$\sqrt{81.64^2+34.30^2+22.71^2} - 86.01 =$	V
300°	$\sqrt{(75+0.37+5.72)^2+(35-0.07-1.85)^2+(23.4+0.81-2.64)^2} - 86.01 =$	$\sqrt{81.09^2+33.08^2+22.47^2} - 86.01 =$	V
330°	$\sqrt{(75-0.41+4.32)^2+(35-0.46-2.17)^2+(23.4+3.39-5.87)^2} - 86.01 =$	$\sqrt{78.91^2+32.37^2+20.92^2} - 86.01 =$	V

MAX AMPLITUDE = $\frac{5.21+5.41}{2}$ = 5.31 FT ACCELERATION = $\left(\frac{2\pi}{Tv}\right)^2 \times 5.3$

22,500 DWT TANKER LOADED 60' WD $\chi = 30°$ Tv = 10

0°	$\sqrt{(75-1.10+0.44)^2+(35-0.58-1.14)^2+(2.30+12.14-7.94)^2} - 82.80 =$	$\sqrt{74.34^2+33.28^2+6.50^2} - 82.80 =$	V
30°	$\sqrt{(75-1.49-2.42)^2+(35-0.65-1.89)^2+(2.30+10.53-6.57)^2} - 82.80 =$	$\sqrt{71.02^2+32.46^2+6.26^2} - 82.80 =$	V
60°	$\sqrt{(75-1.47-4.76)^2+(35-0.53-2.13)^2+(2.30+6.09-3.44)^2} - 82.80 =$	$\sqrt{68.77^2+32.31^2+4.95^2} - 82.80 =$	V
90°	$\sqrt{(75-1.06-5.75)^2+(35-0.29-1.80)^2+(2.30+0.02-0.61)^2} - 82.80 =$	$\sqrt{68.19^2+32.91^2+1.71^2} - 82.80 =$	V
120°	$\sqrt{(75-0.37-5.19)^2+(35+0.09-0.99)^2+(2.30-6.05+1.50)^2} - 82.80 =$	$\sqrt{69.49^2+34.05^2+0.75^2} - 82.80 =$	V
150°	$\sqrt{(75+0.42-3.25)^2+(35+0.36+0.09)^2+(2.30-10.50+7.18)^2} - 82.80 =$	$\sqrt{72.17^2+35.45^2+1.02^2} - 82.80 =$	V
180°	$\sqrt{(75+1.10-0.44)^2+(35+0.58+1.14)^2+(2.30-12.14+7.94)^2} - 82.80 =$	$\sqrt{75.66^2+36.72^2+1.90^2} - 82.80 =$	V
210°	$\sqrt{(75+1.49+2.42)^2+(35+0.65+1.89)^2+(2.30-10.53+6.57)^2} - 82.80 =$	$\sqrt{78.91^2+37.59^2+1.66^2} - 82.80 =$	V
240°	$\sqrt{(75+1.47+4.76)^2+(35+0.53+2.13)^2+(2.30+6.09-3.44)^2} - 82.80 =$	$\sqrt{81.23^2+37.66^2+0.35^2} - 82.80 =$	V
270°	$\sqrt{(75+1.06+5.75)^2+(35+0.29+1.80)^2+(2.30-0.02+0.61)^2} - 82.80 =$	$\sqrt{81.81^2+32.09^2+2.89^2} - 82.80 =$	V
300°	$\sqrt{(75+0.37+5.19)^2+(35-0.09+0.99)^2+(2.30+6.05-9.56)^2} - 82.80 =$	$\sqrt{80.56^2+35.95^2+3.85^2} - 82.80 =$	V
330°	$\sqrt{(75-0.42+3.25)^2+(35-0.36+0.09)^2+(2.30+10.50-7.18)^2} - 82.80 =$	$\sqrt{77.83^2+34.55^2+5.62^2} - 82.80 =$	V

MAX AMPLITUDE $\frac{7.06+7.07}{2}$ = 7.07 FT ACCELERATION = $\left(\frac{2\pi}{Tv}\right)^2 \times 7.07$

66

30° Tw = 10 SEC

91² − 86.01 =	√7,212.25 − 86.01 =	84.92 − 86.01 = − 1.09
1² − 86.01 =	√6,782.12 − 86.01 =	82.35 − 86.01 = − 3.66
2² − 86.01 =	√6,535.65 − 86.01 =	80.84 − 86.01 = − 5.17
9² − 86.01 =	√6,527.91 − 86.01 =	80.80 − 86.01 = − 6.21
3² − 86.01 =	√6,748.23 − 86.01 =	82.15 − 86.01 = − 3.86
9² − 86.01 =	√7,139.68 − 86.01 =	84.50 − 86.01 = − 1.51
3² − 86.01 =	√7,609.71 − 86.01 =	87.23 − 86.01 = + 1.22
9² − 86.01 =	√8,091.87 − 86.01 =	89.68 − 86.01 = + 3.67
2² − 86.01 =	√8,320.02 − 86.01 =	91.21 − 86.01 = + 5.20
1² − 86.01 =	√8,357.32 − 86.01 =	91.42 − 86.01 = + 5.41
9² − 86.01 =	√8,174.78 − 86.01 =	90.41 − 86.01 = + 4.40
2² − 86.01 =	√7,712.25 − 86.01 =	87.82 − 86.01 = + 1.81

$\left(\frac{2\pi}{T_w}\right)^2 \times 5.31 = 2.09^{F}/_{SEC}$ WAVE FORCE MOORING LOAD = 2.09 × 83.7 = 174.9^{k}

T_w = 10 SEC

2² − 82.80 =	√6,676.24 − 82.80 =	81.71 − 82.80 = − 1.09
1² − 82.80 =	√6,136.68 − 82.80 =	78.34 − 82.80 = − 4.46
9² − 82.80 =	√5,799.69 − 82.80 =	76.16 − 82.80 = − 6.64
8² − 82.80 =	√5,735.87 − 82.80 =	75.74 − 82.80 = − 7.06
1² − 82.80 =	√5,981.88 − 82.80 =	77.34 − 82.80 = − 5.46
6² − 82.80 =	√6,466.25 − 82.80 =	80.41 − 82.80 = − 2.39
8² − 82.80 =	√7,076.40 − 82.80 =	84.12 − 82.80 = + 1.32
7² − 82.80 =	√7,649.85 − 82.80 =	87.46 − 82.80 = + 4.66
4² − 82.80 =	√8,086.71 − 82.80 =	89.94 − 82.80 = + 7.14
2² − 82.80 =	√8,076.90 − 82.80 =	89.87 − 82.80 = + 7.07
9² − 82.80 =	√7,797.14 − 82.80 =	88.30 − 82.80 = + 5.50
2² − 82.80 =	√7,282.80 − 82.80 =	85.34 − 82.80 = + 2.54

$\left(\frac{2\pi}{T_w}\right)^2 \times 2.07 = 2.79^{F}/_{SEC}$ WAVE FORCE MOORING LOAD = 2.79 × 83.7 = 233.5^{k}

2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
McD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE
	NdB		4-19-66

22,500 DWT TANKER LIGHT 150' WD $\chi = 30°$ Tw

0°	$\sqrt{(75-1.09-3.55)^2+(35-0.72-1.34)^2+(23.4+5.06-8.15)^2}$	$-86.01 =$	$\sqrt{1036^2+32.9^2}+20.31^2$
30°	$\sqrt{(75-1.47-1.66)^2+(35-0.79-0.98)^2+(23.4+5.37-8.85)^2}$	$-86.01 =$	$\sqrt{71.8^2+33.2^2}+21.28^2$
60°	$\sqrt{(75-1.96+0.68)^2+(35-0.65-0.36)^2+(23.4+4.25-2.72)^2}$	-86.01	$\sqrt{74.72+33.99^2}+23.33^2$
90°	$\sqrt{(75-1.05+2.83)^2+(35-0.33+0.37)^2+(23.4+1.98+0.41)^2}$	$-86.01 =$	$\sqrt{76.78^2+35.04^2}+25.29^2$
120°	$\sqrt{(75-0.37+4.23)^2+(35+0.07+0.99)^2+(23.4-0.81+4.43)^2}$	$-86.01 =$	$\sqrt{78.86^2+36.06^2}+27.02^2$
150°	$\sqrt{(75+0.41+4.49)^2+(35+0.46+1.35)^2+(23.4-3.39+7.26)^2}$	$-86.01 =$	$\sqrt{79.90^2+36.81^2}+27.27^2$
180°	$\sqrt{(75+1.09+3.55)^2+(35+0.72+1.34)^2+(23.4-5.06+8.15)^2}$	$-86.01 =$	$\sqrt{79.69^2+37.06^2}+26.13^2$
210°	$\sqrt{(75+1.47+1.66)^2+(35+0.79+0.98)^2+(23.4-5.37+6.85)^2}$	$-86.01 =$	$\sqrt{78.13^2+35.77^2}+24.88^2$
240°	$\sqrt{(75+1.96-0.68)^2+(35+0.65+0.36)^2+(23.4-4.25+3.72)^2}$	$-86.01 =$	$\sqrt{75.78^2+36.01^2}+22.87^2$
270°	$\sqrt{(75+1.05-2.83)^2+(35+0.33-0.37)^2+(23.4-1.98+0.41)^2}$	$-86.01 =$	$\sqrt{73.22^2+34.96^2}+21.01^2$
300°	$\sqrt{(75+0.37-4.23)^2+(35-0.07-0.99)^2+(23.4+0.81-4.43)^2}$	$-86.01 =$	$\sqrt{71.14^2+33.99^2}+19.78^2$
330°	$\sqrt{(75-0.41-4.49)^2+(35-0.46-1.35)^2+(23.4+3.39-7.26)^2}$	$-86.01 =$	$\sqrt{70.10^2+33.89^2}+19.53^2$

MAX AMPLITUDE $= \frac{6.09+6.03}{2} = 6.06'$ ACCELERATION $= \left(\frac{2\pi}{Tw}\right)^2 \times 6.6 = 2.3$

22,500 DWT TANKER LOADED 150' WD $\chi = 30°$ Tw = 10

0°	$\sqrt{(75-1.10-3.47)^2+(35-0.58-0.76)^2+(2.30+12.14-7.69)^2}$	$-82.80 =$	$\sqrt{70.43^2+33.66^2}+6.75^2$
30°	$\sqrt{(75-1.49-1.19)^2+(35-0.55-2.04)^2+(2.30+10.53-6.54)^2}$	$-82.80 =$	$\sqrt{72.32^2+32.31^2}+6.29^2$
60°	$\sqrt{(75-1.97+1.41)^2+(35+0.53-2.77)^2+(2.30+6.09-3.65)^2}$	$-82.80 =$	$\sqrt{74.94^2+31.70^2}+4.74^2$
90°	$\sqrt{(75-1.06+3.64)^2+(35-0.88-2.75)^2+(2.30+0.02+0.23)^2}$	$-82.80 =$	$\sqrt{77.58^2+31.97^2}+2.55^2$
120°	$\sqrt{(75-0.37+4.88)^2+(35+0.04-2.00)^2+(2.30-6.05+4.09)^2}$	$-82.80 =$	$\sqrt{79.51^2+33.04^2}+0.29^2$
150°	$\sqrt{(75+0.42+4.82)^2+(35+0.36-0.71)^2+(2.30-10.50+6.77)^2}$	$-82.80 =$	$\sqrt{80.24^2+34.65^2}+(-1.42)^2$
180°	$\sqrt{(75+1.10+3.47)^2+(35+0.35+0.76)^2+(2.30-12.14+7.69)^2}$	$-82.80 =$	$\sqrt{79.57^2+36.11^2}+2.15^2$
210°	$\sqrt{(75+1.49+1.19)^2+(35+0.65+2.04)^2+(2.30-10.53+6.54)^2}$	$-82.80 =$	$\sqrt{77.68^2+37.69^2}+1.69^2$
240°	$\sqrt{(75+1.97-1.41)^2+(35+0.53+2.77)^2+(2.30-6.09+3.65)^2}$	$-82.80 =$	$\sqrt{75.06^2+38.30^2}+0.14^2$
270°	$\sqrt{(75+1.06-3.64)^2+(35+0.28+2.75)^2+(2.30-0.02-0.23)^2}$	$-82.80 =$	$\sqrt{72.42^2+38.03^2}+1.05^2$
300°	$\sqrt{(75+0.37-4.88)^2+(35-0.04+2.00)^2+(2.30+6.05-4.09)^2}$	$-82.80 =$	$\sqrt{70.49^2+36.96^2}+1.31^2$
330°	$\sqrt{(75-0.42-4.82)^2+(35-0.36+0.71)^2+(2.30+10.50-6.77)^2}$	$-82.80 =$	$\sqrt{69.76^2+35.35^2}+3.03^2$

MAX AMPLITUDE $= \frac{4.45+4.61}{2} = 4.53'$ ACCELERATION $\left(\frac{2\pi}{Tw}\right)^2 \times 4.5 = 1.79$

6

0° Tw 10 SEC

32.[illegible]	$+20.31^2$	$-86.01 = \sqrt{6,448.07}$	$-86.01 = 80.[illegible]$	-86.01	-5.71
33.[illegible]	$+21.28^2$	$-86.01 = \sqrt{6,752.02}$	$-86.01 = 82.[illegible]$	-86.01	-3.85
33.32	$+22.93^2$	$-86.01 = \sqrt{7,236.57}$	$-86.01 = 85.[illegible]$	-86.01	-0.94
35.04	$+25.29^2$	$-86.01 = \sqrt{7,788.03}$	$-86.01 = 88.[illegible]$	-86.01	$+2.24$
30.06	$+27.02^2$	$-86.01 = \sqrt{8,249.30}$	$-86.01 = 90.[illegible]$	-86.01	$+4.82$
36.81	$+27.27^2$	$-86.01 = \sqrt{8,482.64}$	$-86.01 = 92.[illegible]$	-86.01	$+6.09$
37.06	$+26.49^2$	$-86.01 = \sqrt{8,417.69}$	$-86.01 = 91.7$	-86.01	$+5.74$
36.77	$+24.88^2$	$-86.01 = \sqrt{8,075.34}$	$-86.01 = 89.8$	-86.01	$+3.85$
36.01	$+27.87^2$	$-86.01 = \sqrt{7,562.37}$	$-86.01 = 86.9$	-86.01	$+0.95$
34.36	$+21.01^2$	$-86.01 = \sqrt{7,024.79}$	$-86.01 = 83.8$	-86.01	-2.20
33.94	$+19.78^2$	$-86.01 = \sqrt{6,604.07}$	$-86.01 = 81.2$	-86.01	-4.74
33.[illegible]	$+19.53^2$	$-86.01 = \sqrt{6,397.01}$	$-86.01 = 79.9$	-86.01	-6.03

[illegible] × 6.[illegible] = 2.39 FT/SEC² WAVE FORCE MOVING LOAD = 2.39 × 84.3 = 201.5 K

Tw - 10 SEC

33.69	$+6.75^2$	$-82.80 = \sqrt{6,138.34}$	$-82.80 = 78.3$	-82.80	-4.45
32.31	$+6.29^2$	$-82.80 = \sqrt{6,313.68}$	$-82.80 = 79.4$	-82.80	-3.34
31.70	$+4.74^2$	$-82.80 = \sqrt{6,643.36}$	$-82.80 = 81.5$	-82.80	-1.29
31.97	$+2.55^2$	$-82.80 = \sqrt{7,047.24}$	$-82.80 = 83.9$	-82.80	$+1.15$
33.04	$+0.29^2$	$-82.80 = \sqrt{7,413.57}$	$-82.80 = 86.10$	-82.80	$+3.30$
34.65	$(-1.92)^2$	$-82.80 = \sqrt{7,641.13}$	$-82.80 = 87.41$	-82.80	$+4.61$
36.11	$(-2.15)^2$	$-82.80 = \sqrt{7,639.94}$	$-82.80 = 87.41$	-82.80	$+4.61$
37.69	$(-1.67)^2$	$-82.80 = \sqrt{7,457.57}$	$-82.80 = 86.36$	-82.80	$+3.56$
38.30	$(-0.14)^2$	$-82.80 = \sqrt{7,100.91}$	$-82.80 = 84.27$	-82.80	$+1.47$
38.03	$+2.05^2$	$-82.80 = \sqrt{6,695.14}$	$-82.80 = 81.82$	-82.80	-0.98
36.96	$+3.31^2$	$-82.80 = \sqrt{6,353.46}$	$-82.80 = 79.71$	-82.80	-3.09
35.[illegible]	$+6.03^2$	$-82.80 = \sqrt{6,152.44}$	$-82.80 = 78.44$	-82.80	-4.36

[illegible] = 1.79 FT/SEC² WAVE FORCE MOVING LOAD = 1.79 × 84.3 = 150.9 K

2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

22 500 DWT TANKER 60' WD $\chi = 30°$ $T_W = 10$ SEC

	LIGHT	LOADED
0°	-2.63	-1.72
30°	-1.93	-2.54
60°	-0.71	-2.66
90°	+0.70	-2.09
120°	+1.92	-0.95
150°	+2.63	+0.45

MAX AMPL 2.63'
Acc $\left(\frac{2\pi}{T_W}\right)^2 \times 2.63 = 1.09$ F/SEC^2
FENDER LOAD $1.09 \times 83.7 = 87.0^K$

MAX AMPL 2.66'
Acc $\left(\frac{2\pi}{T_W}\right)^2 \times 2.66 = 1.05$ F/SEC^2
FENDER LOAD $1.05 \times 83.7 = 87.9^K$

22,500 DWT TANKER 150' WD $\chi = 30°$ T_W 10 SEC

	LIGHT	LOADED
0°	-2.06	-1.34
30°	-1.77	-2.69
60°	-1.01	-3.30
90°	+0.04	-3.03
120°	+1.06	-1.96
150°	+2.01	-0.35

MAX AMPL 2.06'
Acc $\left(\frac{2\pi}{T_W}\right)^2 \times 2.06 = 0.81$ F/SEC^2
FENDER LOAD $0.81 \times 84.3 = 68.3^K$

MAX AMPL 3.30'
Acc $\left(\frac{2\pi}{T_W}\right)^2 \times 3.30 = 1.30$ F/SEC^2
FENDER LOAD $1.30 \times 84.3 = 109.6^K$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY		SHEET NO
SUBJECT		
DRAWING NUMBER	COMPUTER N&B	CHECKED BY
		DATE 4-19-66

70,000 DWT TANKER LIGHT 60'WD $\chi = 30°$ $T_W = 1$

$0°$ $\sqrt{(100-1.05-1.84)^2+(35-0.71-0.86)^2+(36.60+4.33-7.56)^2} - 112.09 = \sqrt{97.11^2+3.43^2+3}$

$30°$ $\sqrt{(100-1.43-2.67)^2+(35-0.78-2.00)^2+(36.60+4.93-5.11)^2} - 112.09 = \sqrt{95.90^2+3.14^2+36}$

$60°$ $\sqrt{(100-1.92-2.78)^2+(35-0.63-2.24)^2+(36.60+4.21-1.30)^2} - 112.09 = \sqrt{95.80^2+3.63^2+39}$

$90°$ $\sqrt{(100-1.03-2.14)^2+(35-0.32-2.67)^2+(36.60+2.35+2.87)^2} - 112.09 = \sqrt{96.83^2+32.81^2+41.}$

$120°$ $\sqrt{(100-0.36-0.94)^2+(35+0.08-1.88)^2+(36.60-0.12+6.26)^2} - 112.09 = \sqrt{98.70^2+33.0^2+42.}$

$150°$ $\sqrt{(100+0.39+0.52)^2+(35+0.46-0.59)^2+(36.60-2.57+7.98)^2} - 112.09 = \sqrt{100.91^2+34.7^2+42.}$

$180°$ $\sqrt{(100+1.05+1.84)^2+(35+0.71+0.86)^2+(36.60-4.33+7.56)^2} - 112.09 = \sqrt{102.89^2+36.7^2+39.}$

$210°$ $\sqrt{(100+1.43+2.67)^2+(35+0.78+2.00)^2+(36.60-4.93+5.11)^2} - 112.09 = \sqrt{104.10^2+37.6^2+36.}$

$240°$ $\sqrt{(100+1.92+2.78)^2+(35+0.63+2.24)^2+(36.60-4.21+1.30)^2} - 112.09 = \sqrt{104.20^2+38.7^2+33.6}$

$270°$ $\sqrt{(100+1.03+2.14)^2+(35+0.32+2.67)^2+(36.60-2.35-2.87)^2} - 112.09 = \sqrt{103.17^2+32.0^2+31.}$

$300°$ $\sqrt{(100+0.36+0.94)^2+(35-0.08+1.88)^2+(36.60+0.12-6.26)^2} - 112.09 = \sqrt{101.30^2+36.6^2+30.}$

$330°$ $\sqrt{(100-0.39-0.52)^2+(35-0.46+0.59)^2+(36.60+2.57-7.98)^2} - 112.09 = \sqrt{99.09^2+35.3^2+31.}$

MAX AMPLITUDE $\frac{4.59+4.63}{2} = 4.61'$ ACCELERATION $\left(\frac{2\pi}{T_N}\right)^2 \times 4.61 = 1.26$

70,000 DWT TANKER LOADED 60'WD $\chi = 30°$ $T_W = 12$

$0°$ $\sqrt{(100-1.06-1.80)^2+(35-0.50-0.94)^2+(8.0+11.82-7.45)^2} - 106.25 = \sqrt{97.13^2+33.}$ $+12.07$

$30°$ $\sqrt{(100-1.44-2.60)^2+(35-0.65-1.30)^2+(8.0+9.71-5.15)^2} - 106.25 = \sqrt{95.96^2+32.}$ $+12.66$

$60°$ $\sqrt{(100-1.43-2.65)^2+(35-0.53-1.32)^2+(8.0+5.30-1.47)^2} - 106.25 = \sqrt{95.88^2+33.}$ $+11.83$

$90°$ $\sqrt{(100-1.04-2.07)^2+(35-0.27-0.98)^2+(8.0+0.53+2.60)^2} - 106.25 = \sqrt{96.89^2+33.}$ $+10.07$

$120°$ $\sqrt{(100-0.36-0.88)^2+(35+0.05-0.32)^2+(8.0-5.22+5.98)^2} - 106.25 = \sqrt{98.76^2+34.6}$ $+7.76$

$150°$ $\sqrt{(100+0.40+0.54)^2+(35+0.37+0.32)^2+(8.0-10.29+7.75)^2} - 106.25 = \sqrt{100.34^2+35.6}$ $+5.51$

$180°$ $\sqrt{(100+1.06+1.81)^2+(35+0.59+0.94)^2+(8.0-11.52+7.45)^2} - 106.25 = \sqrt{102.87^2+36.5}$ $+3.93$

$210°$ $\sqrt{(100+1.44+2.60)^2+(35+0.65+1.30)^2+(8.0-9.71+5.15)^2} - 106.25 = \sqrt{104.04^2+36.9}$ $+3.44$

$240°$ $\sqrt{(100+1.43+2.65)^2+(35+0.53+1.32)^2+(8.0-5.30+1.47)^2} - 106.25 = \sqrt{104.12^2+36.8}$ $+3.97$

$270°$ $\sqrt{(100+1.04+2.07)^2+(35+0.27+0.98)^2+(8.0+0.35-2.60)^2} - 106.25 = \sqrt{103.11^2+36.2}$ $+5.75$

$300°$ $\sqrt{(100+0.36+0.88)^2+(35-0.05+0.38)^2+(8.0+6.22-5.98)^2} - 106.25 = \sqrt{101.24^2+35.3}$ $+8.24$

$330°$ $\sqrt{(100-0.40-1.54)^2+(35-0.37-0.32)^2+(8.0+10.29-7.75)^2} - 106.25 = \sqrt{99.06^2+34.3}$ $+10.49$

MAX AMPLITUDE $\frac{4.11+4.27}{2} = 4.19'$ ACCELERATION $= \left(\frac{2\pi}{T_N}\right)^2 \times 4.19$

6

30° Tw = 17 SEC

11² + 3.43² + 33.31² − 112.09 =	√11,661.47 − 112.09 =	10.99 − 112.09 =	− 4.10
0² + 3.14² + 36.42² − 112.09 =	√14,556.21 − 112.09 =	10.52 − 112.09 =	− 4.59
3² + 3.63² + 39.51² − 112.09 =	√11,739.79 − 112.09 =	10.35 − 112.09 =	− 3.74
5² + 32.61² + 41.82² − 112.09 =	√12,199.60 − 112.09 =	11.23 − 112.09 =	− 1.86
0² + 33.10² + 42.74² − 112.09 =	√12,670.64 − 112.09 =	11.56 − 112.09 =	+ 0.47
7² + 34.17² + 42.01² − 112.09 =	√13,163.59 − 112.09 =	11.73 − 112.09 =	+ 2.69
1² + 36.71² + 39.83² − 112.09 =	√13,510.15 − 112.09 =	11.63 − 112.09 =	+ 4.14
1² + 37.16² + 36.28² − 112.09 =	√13,622.96 − 112.09 =	11.72 − 112.09 =	+ 4.63
7² + 37.17² + 33.69² − 112.09 =	√13,464.31 − 112.09 =	11.69 − 112.09 =	+ 3.95
7² + 32.20² + 31.38² − 112.09 =	√13,071.99 − 112.09 =	11.33 − 112.09 =	+ 2.29
7² + 36.53² + 30.96² − 112.09 =	√12,543.79 − 112.09 =	11.20 − 112.09 =	− 0.09
7² + 35.23² + 31.19² − 112.09 =	√12,025.76 − 112.09 =	10.96 − 112.09 =	− 2.43

4.61 = 1.26 FT/SEC² WAVE FORCE MOORING LOAD = 1.26 × 83.7 = 105.5 K

Tw = 12 SEC

2² + 33.42² + 12.07² − 106.25 =	√10,700.16 − 106.25 =	103.49 − 106.25 =	− 2.81
7² + 33.01² + 12.56² − 106.25 =	√10,458.28 − 106.25 =	102.27 − 106.25 =	− 3.98
2² + 33.12² + 11.83² − 106.25 =	√10,431.85 − 106.25 =	102.14 − 106.25 =	− 4.11
2² + 33.72² + 10.07² − 106.25 =	√10,628.14 − 106.25 =	103.09 − 106.25 =	− 3.16
2 34.62² + 7.76² − 106.25 =	√11,015.76 − 106.25 =	104.96 − 106.25 =	− 1.29
35.69² + 6.51² − 106.25 =	√11,493.02 − 106.25 =	107.21 − 106.25 =	+ 0.96
36.52² + 3.93² − 106.25 =	√11,932.12 − 106.25 =	109.23 − 106.25 =	+ 2.98
36.93² + 3.44² − 106.25 =	√12,207.46 − 106.25 =	110.46 − 106.25 =	+ 4.21
36.85² + 3.97² − 106.25 =	√12,214.56 − 106.25 =	110.52 − 106.25 =	+ 4.27
36.25² + 5.75² − 106.25 =	√11,978.80 − 106.25 =	109.45 − 106.25 =	+ 3.20
35.33² + 8.24² − 106.25 =	√11,565.64 − 106.25 =	107.54 − 106.25 =	+ 1.29
34.31² + 10.49² − 106.25 =	√11,100.10 − 106.25 =	105.36 − 106.25 =	− 0.89

(2π/Tw)² × 4.15 = 1.15 FT/SEC² WAVE FORCE MOORING LOAD = 1.15 × 83.7 = 96.3 K

2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY		SHEET NO
SUBJECT		
DRAWING NUMBER	COMPUTER NdB	CHECKED BY / DATE 4-20-66

70,000 DWT TANKER LIGHT 150' WD X = 30° Tw = 12 S

0°	$\sqrt{(100-1.05-1.96)^2+(35-0.71+0.36)^2+(36.60+19.33-7.57)^2}-112.09=$	$\sqrt{56.99^2+34.36^2+3.36^2}-11$
30°	$\sqrt{(100-1.43-3.03)^2+(35-0.28-1.35)^2+(36.60+4.93-5.27)^2}-112.09=$	$\sqrt{95.54^2+32.87^2+3.26^2}-11$
60°	$\sqrt{(100-1.42-3.29)^2+(35-0.63-2.70)^2+(36.60+9.21-1.56)^2}-112.09=$	$\sqrt{95.29^2+31.67^2+3.25^2}-112$
90°	$\sqrt{(100-1.03-2.66)^2+(35-0.32-3.32)^2+(36.60+2.35+2.57)^2}-112.09=$	$\sqrt{96.31^2+31.36^2+4.52^2}-112$
120°	$\sqrt{(100-0.36-1.32)^2+(35+0.08-3.06)^2+(36.60-0.12+6.01)^2}-112.09=$	$\sqrt{98.32^2+32.02^2+4.49^2}-112$
150°	$\sqrt{(100+0.39+0.32)^2+(35+2.92-1.97)^2+(36.60-2.57+7.84)^2}-112.09=$	$\sqrt{100.76^2+33.45^2+4.17^2}-112$
180°	$\sqrt{(100+1.05+1.96)^2+(35+0.71-0.36)^2+(36.60-4.33+7.57)^2}-112.09=$	$\sqrt{103.01^2+35.35^2+3.29^2}-112$
210°	$\sqrt{(100+1.43+3.03)^2+(35+0.28+1.35)^2+(36.60-4.93+5.27)^2}-112.09=$	$\sqrt{104.96^2+37.13^2+3.6^2}-112$
240°	$\sqrt{(100+1.42+3.29)^2+(35+0.63+2.70)^2+(36.60+1.21+1.56)^2}-112.09=$	$\sqrt{104.71^2+38.33^2+3.3^2}-112$
270°	$\sqrt{(100+1.03+2.66)^2+(35+0.32+3.32)^2+(36.60-2.35-2.57)^2}-112.09=$	$\sqrt{103.69^2+38.69^2+3.1^2}-112$
300°	$\sqrt{(100+0.36+1.32)^2+(35-0.08+3.06)^2+(36.60+0.12-6.01)^2}-112.09=$	$\sqrt{101.68^2+37.38^2+3.0^2}-112$
330°	$\sqrt{(100-0.39+1.37)^2+(35-0.42+1.97)^2+(36.60+2.57-7.84)^2}-112.09=$	$\sqrt{99.24^2+36.55^2+3.1^2}-112$

MAX AMPLITUDE = $\frac{4.74+4.76}{2}$ = 4.75' ACCELERATION = $\left(\frac{2\pi}{Tw}\right)^2 \times 4.75$

70,000 DWT TANKER LOADED 150 WD X = 30° Tw = 12 SE

0°	$\sqrt{(100-1.06-1.93)^2+(35-0.59-0.97)^2+(8.0+11.52-7.55)^2}-106.25=$	$\sqrt{97.01^2+33.44^2+1.97^2}-106$
30°	$\sqrt{(100-1.44-2.91)^2+(35-0.65-1.35)^2+(8.0+9.71-5.33)^2}-106.25=$	$\sqrt{95.65^2+33.00^2+1.08^2}-106.2$
60°	$\sqrt{(100-1.43-3.11)^2+(35-0.53-1.38)^2+(8.0+5.30-1.69)^2}-106.25=$	$\sqrt{95.16^2+33.03^2+1.11^2}-106.2$
90°	$\sqrt{(100-1.09-2.97)^2+(35-0.27-1.03)^2+(8.0-0.53+2.40)^2}-106.25=$	$\sqrt{96.49^2+33.80^2+2.3^2}-106.2$
120°	$\sqrt{(100-0.36-1.18)^2+(35+0.05-0.41)^2+(8.0-6.22+5.85)^2}-106.25=$	$\sqrt{98.46^2+34.64^2+2.1^2}-106.2$
150°	$\sqrt{(100+0.40+0.43)^2+(35+0.37+1.32)^2+(8.0-10.24+7.74)^2}-106.25=$	$\sqrt{100.83^2+35.69^2+5.2^2}-106.2$
180°	$\sqrt{(100+1.06+1.93)^2+(35+0.59+0.97)^2+(8.0-11.52+7.55)^2}-106.25=$	$\sqrt{102.93^2+36.56^2+4.8^2}-106.2$
210°	$\sqrt{(100+1.44+2.91)^2+(35+0.65+1.35)^2+(8.0-9.71+5.33)^2}-106.25=$	$\sqrt{104.35^2+37.00^2+3.6^2}-106.2$
240°	$\sqrt{(100+1.43+3.11)^2+(35+0.53+1.38)^2+(8.0-5.30+1.69)^2}-106.25=$	$\sqrt{104.54^2+36.91^2+4.3^2}-106.2$
270°	$\sqrt{(100+1.09+2.97)^2+(35+0.27+1.03)^2+(8.0+0.53-2.40)^2}-106.25=$	$\sqrt{103.51^2+36.30^2+6.1^2}-106.2$
300°	$\sqrt{(100+0.36+1.18)^2+(35+0.05+0.41)^2+(8.0+6.22-5.85)^2}-106.25=$	$\sqrt{101.54^2+35.36^2+8.3^2}-106.25$
330°	$\sqrt{(100-0.40-0.43)^2+(35-0.37-1.32)^2+(8.0+10.24-7.74)^2}-106.25=$	$\sqrt{99.17^2+35.31^2+10.3^2}-106.25$

MAX AMPLITUDE = $\frac{4.55+4.70}{2}$ = 4.63 FT ACCELERATION = $\left(\frac{2\pi}{Tw}\right)^2 \times 4$

6

Tw = .12 Sec

$.36^2 + 3.36^2$ − 112.09	$\sqrt{11,700.56}$ − 112.09	108.17 − 112.09	− 3.92
$.87^2 + 3.26^2$ − 112.09	$\sqrt{11,523.72}$ − 112.09	107.35 − 112.09	− 4.74
$.67^2 + 3.25^2$ − 112.09	$\sqrt{11,623.74}$ − 112.09	107.81 − 112.09	− 4.28
$.36^2 + 4.32^2$ − 112.09	$\sqrt{11,982.98}$ − 112.09	109.47 − 112.09	− 2.62
$.52^2 + 4.39^2$ − 112.09	$\sqrt{12,497.50}$ − 112.09	111.79 − 112.09	− 0.30
$.75^2 + 41.7^2$ − 112.09	$\sqrt{13,029.58}$ − 112.09	114.13 − 112.09	+ 2.04
$.95^2 + 39.9^2$ − 112.09	$\sqrt{13,497.91}$ − 112.09	115.97 − 112.09	+ 3.88
$.5^2 + 36.9^2$ − 112.09	$\sqrt{13,655.09}$ − 112.09	116.85 − 112.09	+ 4.76
$.3^2 + 33.5^2$ − 112.09	$\sqrt{13,585.98}$ − 112.09	116.56 − 112.09	+ 4.47
$.9^2 + 31.6^2$ − 112.09	$\sqrt{13,248.29}$ − 112.09	115.10 − 112.09	+ 3.01
$.8^2 + 30.7^2$ − 112.09	$\sqrt{12,724.41}$ − 112.09	112.80 − 112.09	+ 0.71
$.5^2 + 31.3^2$ − 112.09	$\sqrt{12,166.05}$ − 112.09	110.30 − 112.09	− 1.79

$\left(\frac{2\pi}{Tw}\right)^2 \times 4.75 = 1.30\ ^{FT}/_{SEC^2}$ WAVE FORCE MOORING LOAD = 1.30 × 84.3 = 109.6 K

Tw = .12 SEC

$.49^2 + 107^2$ − 106.25	$\sqrt{10,672.45}$ − 106.25	103.31 − 106.25	− 2.94
$.00^2 + 108^2$ − 106.25	$\sqrt{10,391.19}$ − 106.25	101.94 − 106.25	− 4.31
$.03^2 + 111^2$ − 106.25	$\sqrt{10,342.35}$ − 106.25	101.70 − 106.25	− 4.55
$.90^2 + 3.5^2$ − 106.25	$\sqrt{10,593.43}$ − 106.25	102.88 − 106.25	− 3.37
$.41^2 + 7.1^2$ − 106.25	$\sqrt{10,952.52}$ − 106.25	104.65 − 106.25	− 1.60
$.0^2 + 5.3^2$ − 106.25	$\sqrt{11,170.72}$ − 106.25	107.10 − 106.25	+ 0.85
$.56^2 + 4.8^2$ − 106.25	$\sqrt{11,359.81}$ − 106.25	109.36 − 106.25	+ 3.11
$.00^2 + 3.6^2$ − 106.25	$\sqrt{12,271.03}$ − 106.25	110.77 − 106.25	+ 4.52
$.1^2 + 4.3^2$ − 106.25	$\sqrt{12,310.23}$ − 106.25	110.95 − 106.25	+ 4.70
$.0^2 + 6.1^2$ − 106.25	$\sqrt{12,069.59}$ − 106.25	109.86 − 106.25	+ 3.61
$.56^2 + 8.3^2$ − 106.25	$\sqrt{11,630.76}$ − 106.25	107.85 − 106.25	+ 1.60
$.1^2 + 10.3^2$ − 106.25	$\sqrt{11,054.50}$ − 106.25	105.14 − 106.25	− 1.11

$\left(\frac{2\pi}{Tw}\right)^2 \times 4.63 = 1.27\ ^{FT}/_{SEC^2}$ WAVE FORCE MOORING LOAD = 1.27 × 84.3 = 107.1 K

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO.
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

70,000 DWT TANKER 60' WD X = 30° TW = 12 SEC

	LIGHT	LOADED
0°	-1.57	-1.53
30°	-2.86	-1.95
60°	-3.37	-1.85
90°	-2.99	-1.25
120°	-1.80	-0.33
150°	-0.13	+0.69

MAX AMPL 3.37
ACC. $\left(\frac{2\pi}{Tw}\right)^2 \times 3.37 = 0.92$ F/SEC²

FENDER LOAD = 0.92 × 83.7 = 77.0 K

MAX AMPL 1.95
ACC $\left(\frac{2\pi}{Tw}\right)^2 \times 1.95 = 0.53$ F/SEC²

FENDER LOAD = 0.53 × 83.7 = 44.4 K

70,000 DWT TANKER 150' WD X = 30° TW = 12 SEC

	LIGHT	LOADED
0°	-0.35	-1.56
30°	-2.13	-2.00
60°	-3.33	-1.91
90°	-3.64	-1.30
120°	-2.98	-0.36
150°	-1.55	+0.69

MAX AMPL 3.64
ACC $\left(\frac{2\pi}{Tw}\right)^2 \times 3.64 = 1.00$ F/SEC²

FENDER LOAD = 1.00 × 84.3 = 84.3 K

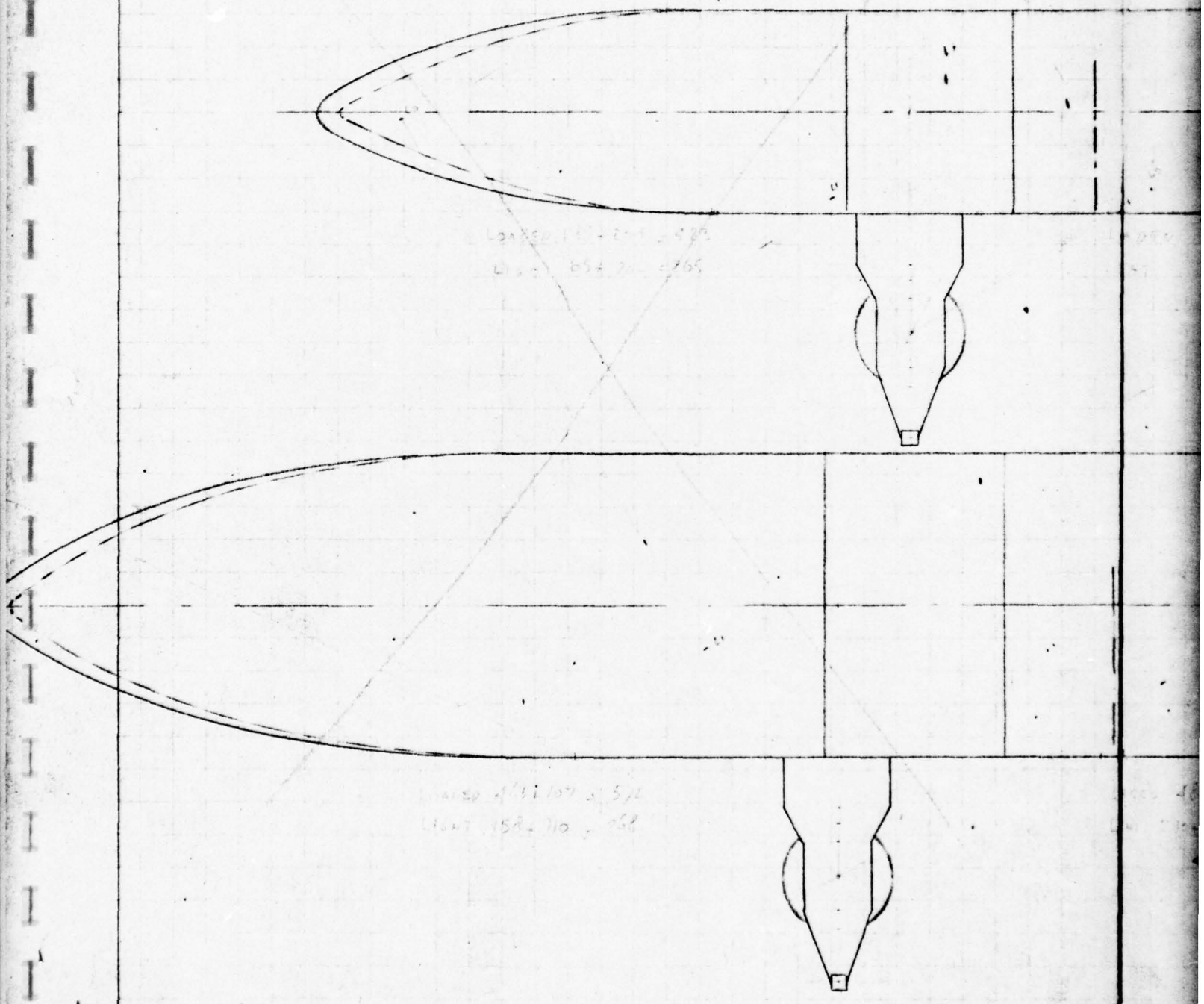
MAX AMPL 2.00
ACC $\left(\frac{2\pi}{Tw}\right)^2 \times 2.00 = 0.55$ F/SEC²

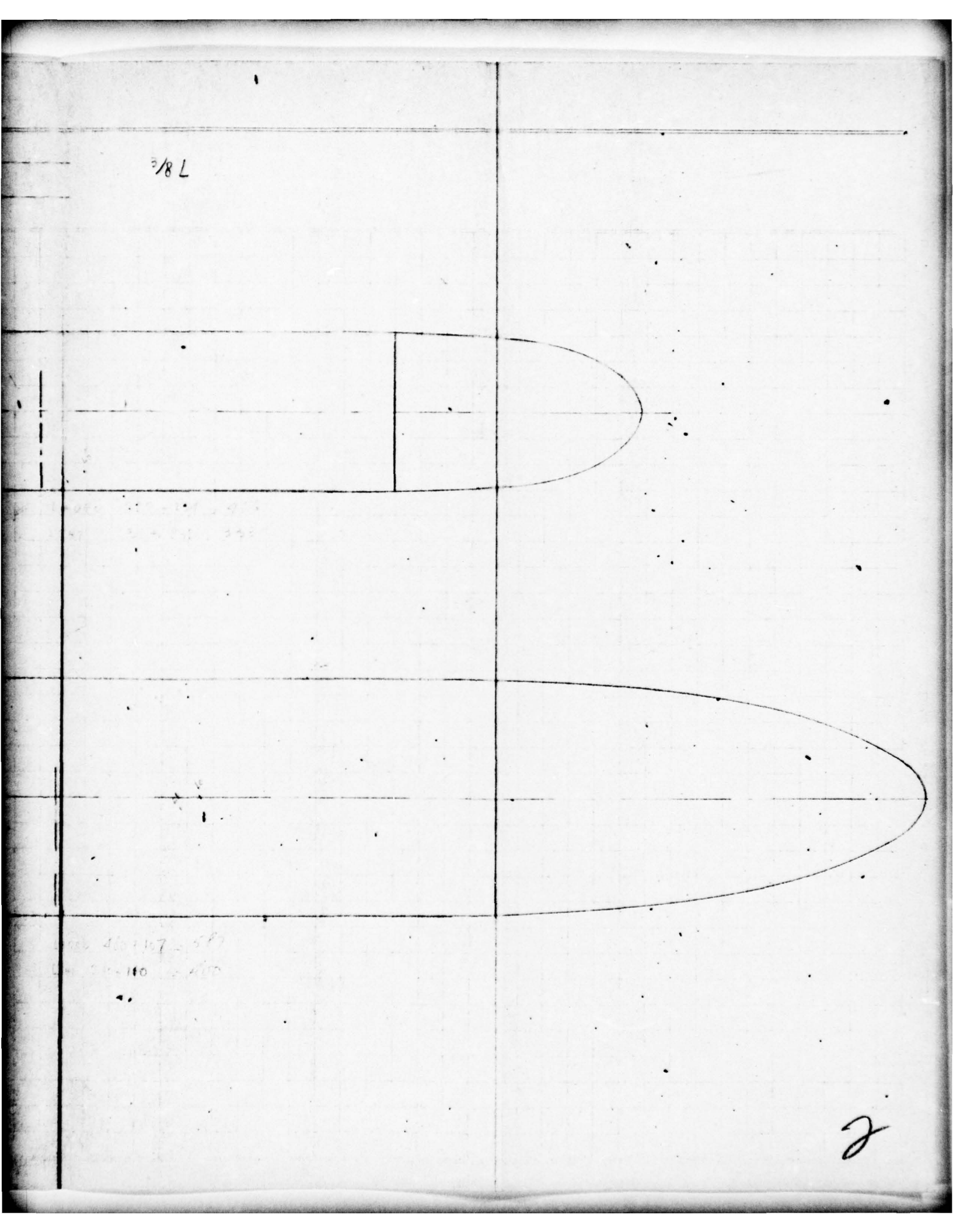
FENDER LOAD = 0.55 × 84.3 = 46.3 K

ENGINEERING DEPARTMENT
COMPUTATION SHEET
McD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE




3/8 L

SECTION III

REVISED

CURRENT RESISTANCE CALCULATIONS

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
CURRENT RESISTANCE			
SUBJECT			
REVISED 0° HEADING			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

$$R_f = C_f \times \frac{\rho}{2} \times S \times V^2$$

S. WETTED SURFACE = $1.18 \times 136,940 = 153,373$ SQ FT FOR LOADED 70,000 DWT
$S = 1.12 \times 61,037 = 68,361$ SQ FT FOR LOADED 22,500 DWT

$S = 153,373 - 2 \times 839.1 \times (44 - 24) = 153,373 - 33,564 = 119,809$ SQ FT
FOR 70,000 DWT BALLAST

$S = 68,361 - 2 \times 579.2 \times (32.4 - 17.8) = 68,361 - 16,913 = 51,448$ SQ FT
FOR 22,500 DWT BALLAST

70,000 DWT

$$R_e = \frac{VL}{\nu} = \frac{6.76 \times 839.1}{1.1088 \times 10^{-5}} = \frac{5.6686 \times 10^3}{1.1088 \times 10^{-5}} = 5.11 \times 10^{-8} \qquad C_f = 1.666 \times 10^{-3}$$

22,500 DWT

$$R_e = \frac{VL}{\nu} = \frac{6.76 \times 579.2}{1.1088 \times 10^{-5}} = \frac{3.9086 \times 10^3}{1.1088 \times 10^{-5}} = 3.53 \times 10^{-8} \qquad C_f = 1.746 \times 10^{-3}$$

70,000 DWT
LOADED

$R_f = 1.666 \times 10^{-6} \times 1 \times 153,373 \times 6.76^2 = 11.68^K$

BALLAST

$R_f = 1.666 \times 10^{-6} \times 1 \times 119,809 \times 6.76^2 = 9.12^K$

22,500 DWT
LOADED

$R_f = 1.746 \times 10^{-6} \times 1 \times 68,361 \times 6.76^2 = 5.45^K$

BALLAST

$R_f = 1.746 \times 10^{-6} \times 1 \times 51,448 \times 6.76^2 = 4.11^K$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT: WIND RESISTANCE			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

WIND RESISTANCE
70,000 DWT TANKER
LOADED.

AHEAD WIND AREA HULL $115.0 \times (60.0 - 44.0 + 9.0) \times 0.3 =$ 862.5 SQ FT
SUPERSTRUCT $115.0 \times (5 \times 9 + 4 \times 9) =$ 9,315.0 SQ FT
TOTAL $A_A =$ 10,177.5 SQ FT
BEAM WIND AREA HULL $A_B = 860 \times (60 - 44.0 + 3.0) =$ 16,340.0 SQ FT

BALLAST
AHEAD WIND AREA HULL $115.0 \times (60.0 - 24.0 + 9.0) \times 0.3 =$ 1,552.5 SQ FT
SUPERSTRUCT 9,315.0 SQ FT
TOTAL 10,867.5 SQ FT
BEAM WIND AREA HULL $860 \times (60 - 24 + 3) =$ 33,540.0 SQ FT

22,500 DWT TANKER
LOADED
AHEAD WIND AREA HULL $72.0 \times (42.7 - 32.4 + 9.0) \times 0.3 =$ 916.9 SQ FT
SUPERSTRUCT $72.0 \times (4 \times 9 + 5 \times 9) =$ 4,536.0 SQ FT
TOTAL 4,952.9 SQ FT
BEAM WIND AREA HULL $595 \times (42.7 - 32.4 + 3) =$ 7,913.5 SQ FT

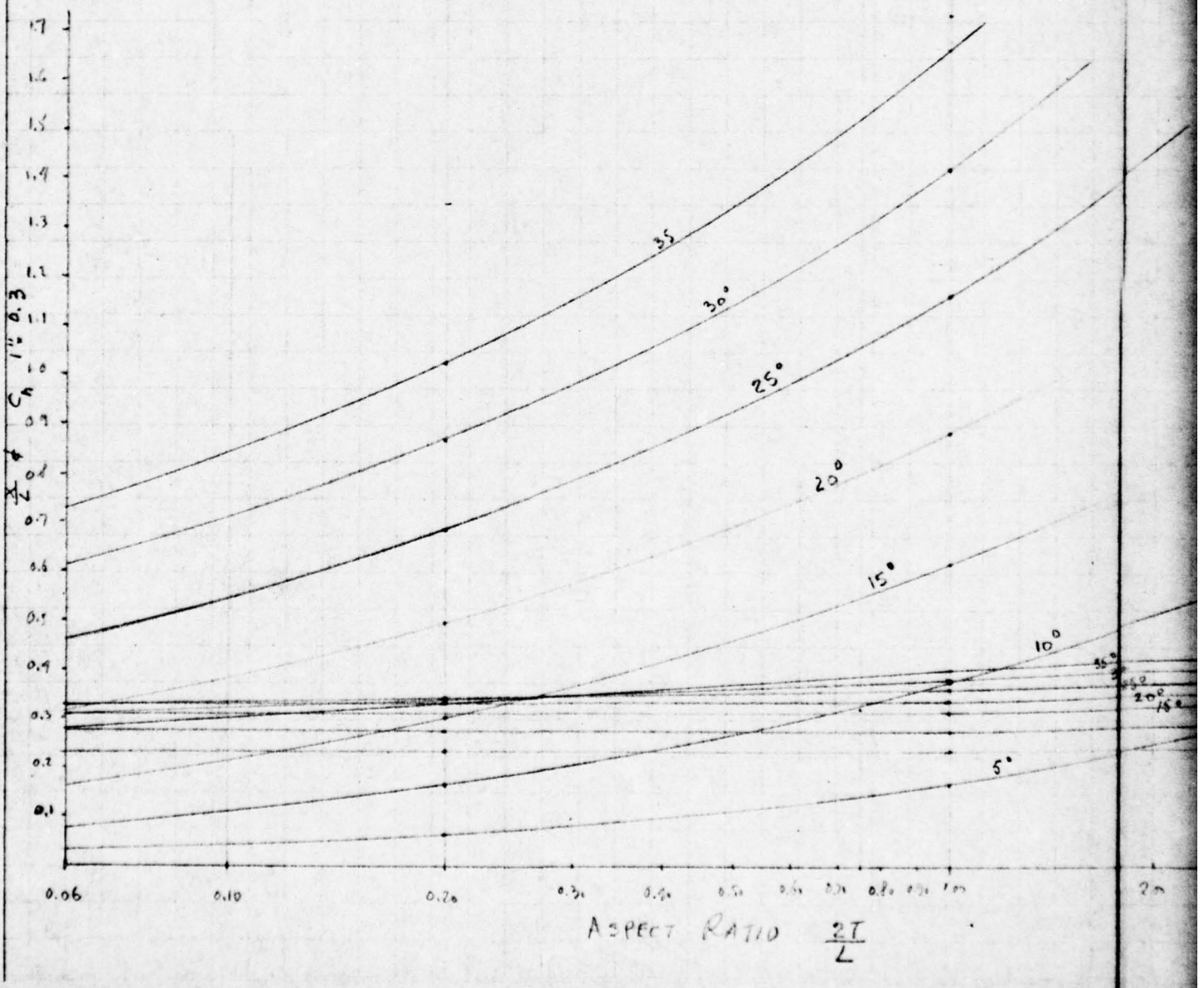
BALLAST
AHEAD WIND AREA HULL $72.0 \times (42.7 - 17.8 + 9.0) \times 0.3 =$ 732.2 SQ FT
SUPERSTRUCT 4,536.0 SQ FT
TOTAL = 5,268.2 SQ FT
BEAM WIND AREA HULL $.595 \times (42.7 - 17.8) =$ 14,815.5 SQ FT

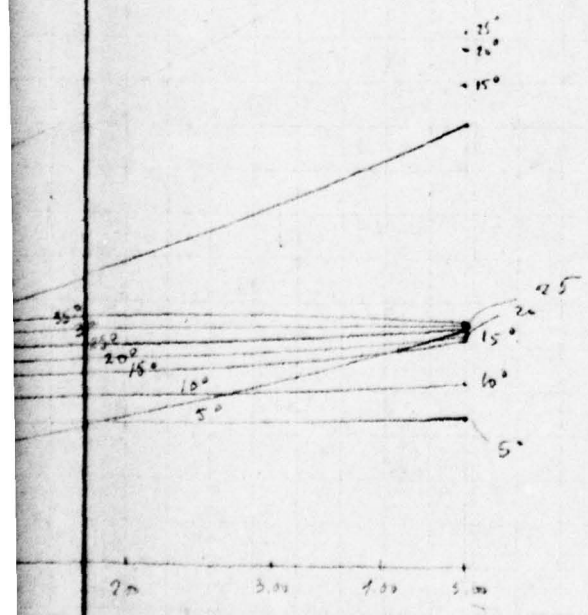
ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

C_M CENTER OF EFFORT FOR 5 TO 35° ANGLE





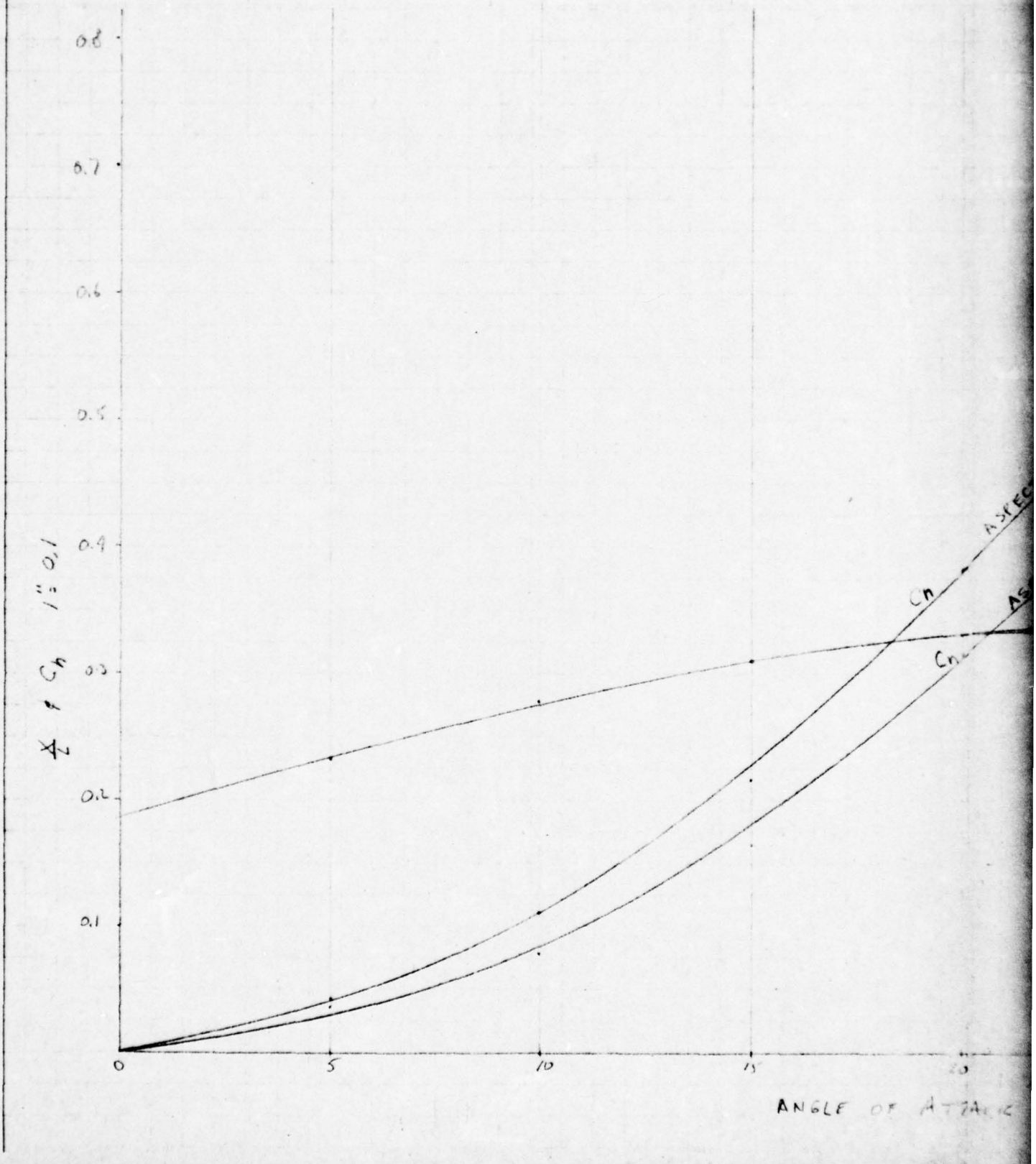
FROM FIG: 6 PAGE 204 PRINCIPLES OF NAVAL ARCHITECTURE

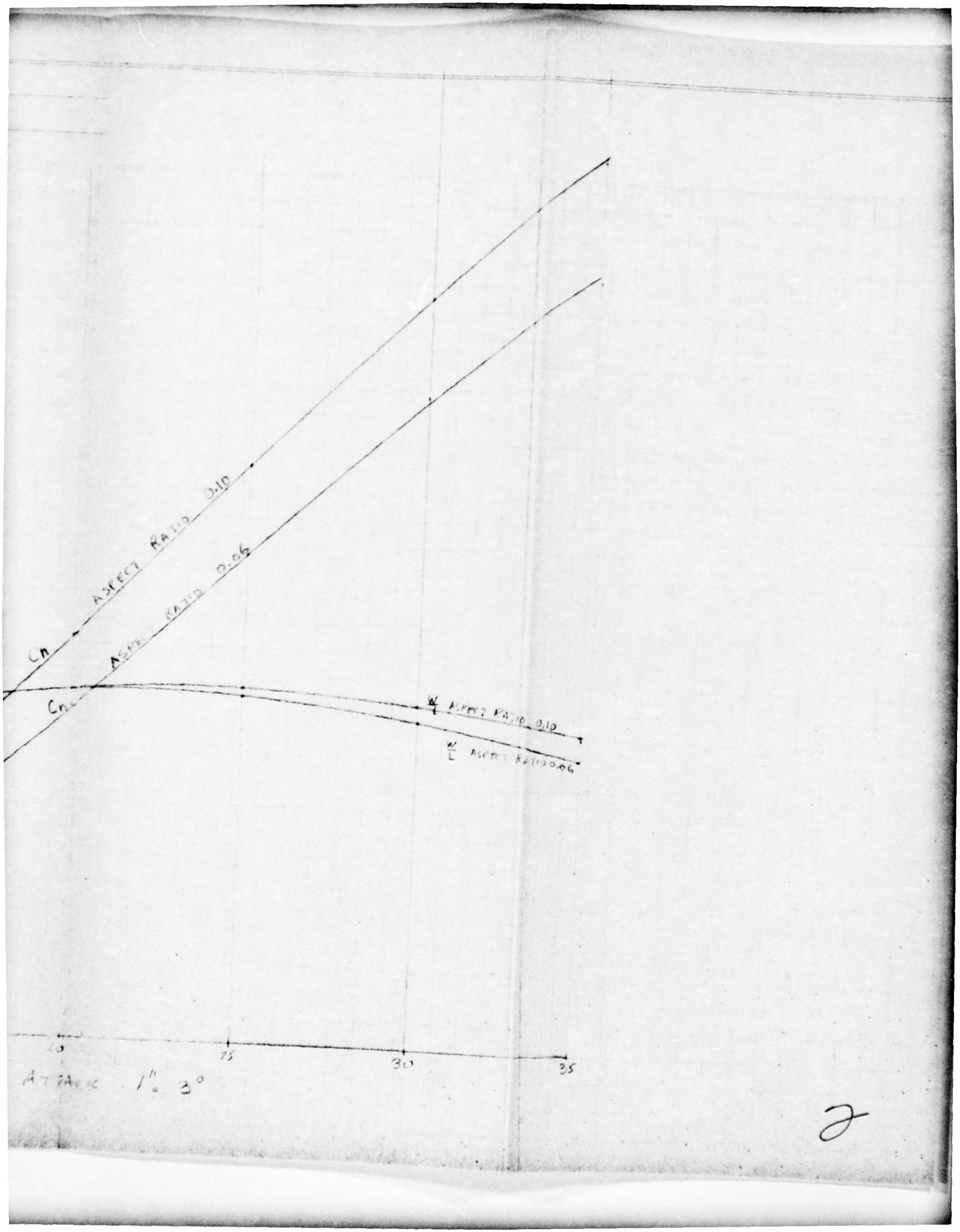
2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

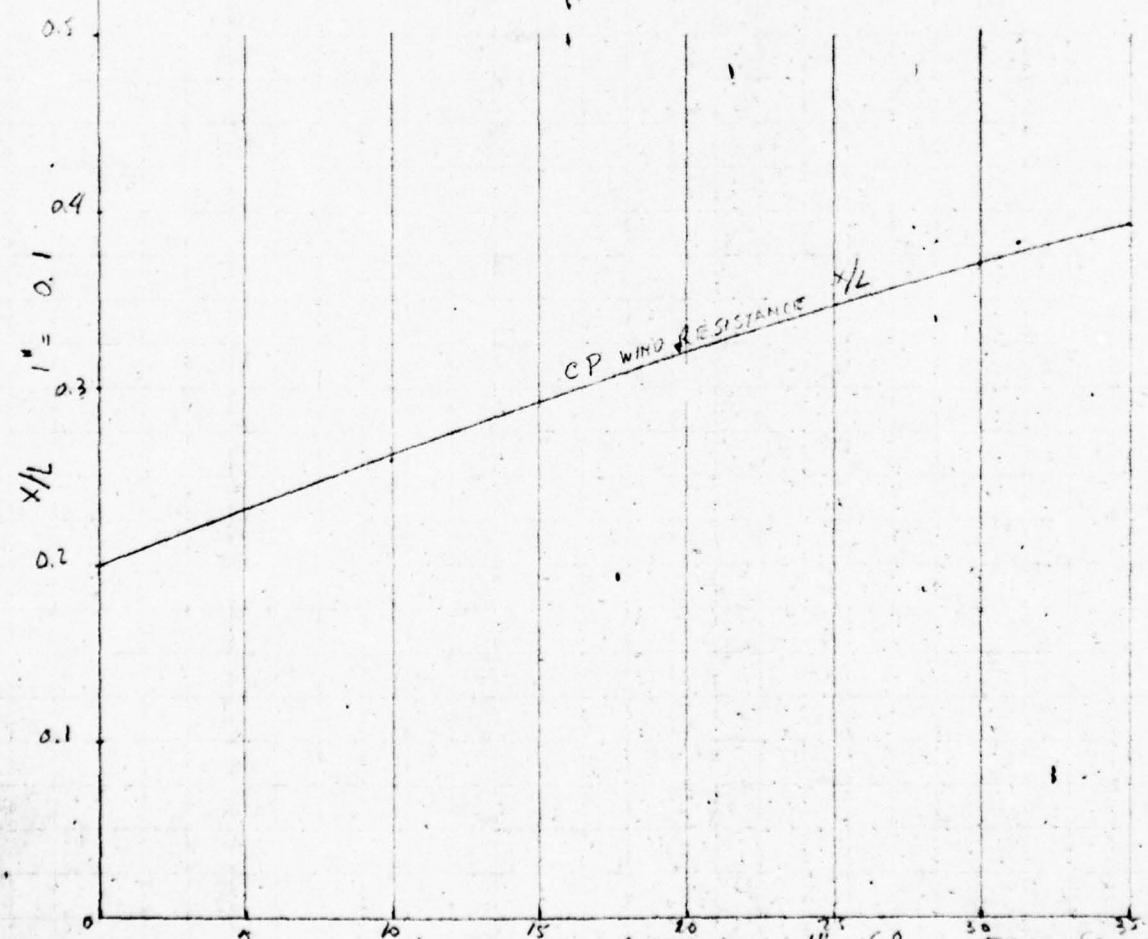



ASPECT RATIO 0.10
ASPECT RATIO 0.06
W/L ASPECT RATIO 0.10
W/L ASPECT RATIO 0.06
25
30
35
1" = 3°

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT: CENTER OF PRESSURE OF WIND RESISTANCE			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE



FROM SAUNDERS
VOL II PAGE 285

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY		SHEET NO
SUBJECT		
DRAWING NUMBER	COMPUTER	CHECKED BY / DATE

70,000 DWT TANKER

	LOADED	BALLAST	
5°	$R_f = 11.68^k$ $F_{nc} = 0.04 \times 1 \times 36,920.4 \times 6.76' = 70.15^k$ $CP_c = 0.235 \times 839.1 = 197.2'$ $R_w = 1.18 \times 0.00119 \times 10,177.5 \times 67.6' \times 1.05 = 68.58^k$ $R_{nw} = 0.03 \times 0.00119 \times 16,340.0 \times 67.6' = 2.67^k$ $CP_w = 0.237 \times 839.1 = 199.7'$	$R_f = 9.12^k$ $F_{nc} = 0.03 \times 1 \times 20,306.2 \times 6.76' = 27.89^k$ $CP_c = 0.235 \times 839.1 = 197.2'$ $R_w = 1.18 \times 0.00119 \times 10,867.5 \times 67.6' \times 1.05 = 73.21^k$ $R_{nw} = 0.04 \times 0.00119 \times 33,540.0 \times 67.6' = 7.29^k$ $CP_w = 0.232 \times 839.1 = 194.7'$	5°
10°	$R_f = 11.68$ $F_{nc} = 0.11 \times 45.7 \times 36,920.4 = 185.60^k$ $CP_c = 0.273 \times 839.1 = 229.1'$ $R_w = 6.416 \times 10,177.5 \times 1.12 = 73.13^k$ $R_{nw} = 0.083 \times 5.437 \times 16,340.0 = 7.37^k$ $CP_w = 0.263 \times 839.1 = 220.7'$	$R_f = 9.12^k$ $F_{nc} = 0.083 \times 45.7 \times 20,306.2 = 77.02^k$ $CP_c = 0.273 \times 839.1 = 229.1'$ $R_w = 6.416 \times 10,867.5 \times 1.12 = 78.09^k$ $R_{nw} = 0.11 \times 5.437 \times 33,540.0 = 20.06^k$ $CP_w = 0.263 \times 839.1 = 220.7'$	10°
15°	$R_f = 11.68^k$ $F_{nc} = 0.228 \times 45.7 \times 36,920.4 = 384.70^k$ $CP_c = 0.310 \times 839.1 = 260.1'$ $R_w = 6.416 \times 10,177.5 \times 1.2 = 78.36^k$ $R_{nw} = 0.182 \times 5.437 \times 16,340.0 = 16.17^k$ $CP_w = 0.293 \times 839.1 = 245.9'$	$R_f = 9.12^k$ $F_{nc} = 0.182 \times 45.7 \times 20,306.2 = 168.89^k$ $CP_c = 0.310 \times 839.1 = 260.1'$ $R_w = 6.416 \times 10,867.5 \times 1.2 = 83.67^k$ $R_{nw} = 0.228 \times 5.437 \times 33,540.0 = 41.58^k$ $CP_w = 0.293 \times 839.1 = 245.9'$	15°
20°	$R_f = 11.68^k$ $F_{nc} = 0.381 \times 45.7 \times 36,920.4 = 642.85^k$ $CP_c = 0.332 \times 839.1 = 278.6'$ $R_w = 6,416 \times 10,177.5 \times 1.24 = 80.97^k$ $R_{nw} = 0.312 \times 5.437 \times 16,340.0 = 27.72^k$ $CP_w = 0.322 \times 839.1 = 270.2'$	$R_f = 9.12^k$ $F_{nc} = 0.312 \times 45.7 \times 20,306.2 = 289.53^k$ $CP_c = 0.331 \times 839.1 = 277.7'$ $R_w = 6.416 \times 10,867.5 \times 1.24 = 86.46^k$ $R_{nw} = 0.381 \times 5.437 \times 33,540.0 = 69.48^k$ $CP_w = 0.322 \times 839.1 = 270.2'$	20°

CURRENT

$R_f = C_f \times \frac{\rho}{2} \times S \times V^2$

$F_{nc} = C_n \times \frac{\rho}{2} \times L \times T \times V^2$

$CP_c = L \times \frac{X}{L}$

WIND

$R_w = \times \frac{\rho}{2} \times A_A \times V^2 \times K_\theta$

$R_{nw} = C \times \frac{\rho}{2} \times A_B \times V^2$

$CP_w = L \times \frac{X}{L}$

22,5[illegible] DWT TANKER

	LOADED	BALLAST
5°	R_f 5.45[k] F_{nc} 0.09×1×18,766.1×6.76' = 34.30[k] CP_c 0.235×579.2 = 136.1' R_w = 1.18×0.00119×4,952.0×67.6'×1.05 = 33.45[k] R_{nw} = 0.03×0.00119×7,913.5×67.6' = 1.29[k] CP_w = 0.232×579.2 = 134.4'	R_f 4.11[k] F_{nc} = 0.03×1×10,309.8×67.6' = 14.1[k] CP_c 0.235×579.2 = 136.1' R_w = 1.18×0.00119×5,268.2×1.05×67.6' = 35.19[k] R_{nw} = 0.04×0.00119×14,815.5×67.6' = 3.22[k] CP_w = 0.232×579.2 = 134.4'
10°	R_f = 5.45[k] F_{nc} = 0.11×45.7×18,766.1 = 94.34[k] CP_c = 0.273×579.2 = 158.1 R_w = 6.416×4,952.0×1.12 = 35.59[k] R_{nw} = 0.083×5,437×7,913.5 = 3.57[k] CP_w = 0.263×579.2 = 152.3'	R_f = 4.11[k] F_{nc} = 0.082×45.7×10,309.8 = 39.11[k] CP_c = 0.273×579.2 = 158.1 R_w = 6.416×5,268.2×1.12 = 37.86[k] R_{nw} = 0.11×5,437×14,815.5 = 8.86[k] CP_w = 0.263×579.2 = 152.3'
15°	R_f = 5.45[k] F_{nc} = 0.228×45.7×18,766.1 = 195.54[k] CP_c = 0.310×579.2 = 179.6' R_w = 6.416×4,952.0×1.2 = 38.13[k] R_{nw} = 0.182×5,437×7,913.5 = 7.83[k] CP_w = 0.293×579.2 = 169.7'	R_f = 4.11[k] F_{nc} = 0.182×45.7×10,309.8 = 85.75[k] CP_c = 0.310×579.2 = 179.6' R_w = 6.416×5,268.2×1.2 = 40.56[k] R_{nw} = 0.288×5,437×14,815.5 = 18.37[k] CP_w = 0.293×579.2 = 169.7'
20°	R_f 5.45[k] F_{nc} = 0.381×45.7×18,766.1 = 326.75[k] CP_c = 0.332×579.2 = 192.3' R_w = 6,416×4,952.0×1.24 = R_{nw} = 0.312×5,437×7,913.5 = CP_w = 0.322×579.2 =	R_f = 4.11[k] F_{nc} = 0.342×45.7×10,309.8 = 147.00[k] CP_c = 0.331×579.2 = 191.7' R_w = 6,416×5,268.2×1.24 = R_{nw} = 0.381×5,437×14,815.5 = CP_w = 0.322×579.2 =

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY MCDERMOTT & CO., INC.

COMPANY | SHEET NO

SUBJECT

DRAWING NUMBER | COMPUTER | CHECKED BY | DATE

70,000 DWT TANKER

	LOADED	BALLAST	
25°	R_f = 11.68^K F_{nc} = 0.547 × 45.7 × 36,920.4 = 922.93^K CP_c = 0.337 × 839.1 = 282.8' R_w = 6.416 × 10,177.5 × 1.28 = 83.58^K R_{nw} = 0.462 × 5.437 × 16,340.0 = 41.04^K CP_w = 0.348 × 839.1 = 292.0'	R_f = 9.12^K F_{nc} = 0.462 × 45.7 × 20,306.2 = 428.73^K CP_c = 0.328 × 839.1 = 275.2' R_w = 6.416 × 10,867.5 × 1.28 = 89.25^K R_{nw} = 0.547 × 5,437 × 33,540.0 = 99.75^K CP_w = 0.348 × 839.1 = 292.0'	25°
30°	R_f = 11.68^K F_{nc} = 0.711 × 45.7 × 36,920.4 = 1,199.69^K CP_c = 0.329 × 839.1 = 271.9' R_w = 6.416 × 10,177.5 × 1.3 = 84.89^K R_{nw} = 0.611 × 5,437 × 16,340.0 = 54.28^K CP_w = 0.372 × 839.1 = 312.1'	R_f = 9.12^K F_{nc} = 0.611 × 45.7 × 20,306.2 = 567.00^K CP_c = 0.309 × 839.1 = 259.3' R_w = 6.416 × 10,867.5 × 1.3 = 90.64^K R_{nw} = 0.711 × 5,437 × 33,540.0 = 129.66^K CP_w = 0.372 × 839.1 = 312.1'	30°
35°	R_f = 11.68^K F_{nc} = 0.848 × 45.7 × 36,920.4 = 1,430.80^K CP_c = 0.301 × 839.1 = 252.6' R_w = 6.416 × 10,177.5 × 1.28 = 83.58^K R_{nw} = 0.737 × 5,437 × 16,340.0 = 65.48^K CP_w = 0.393 × 839.1 = 329.8'	R_f = 9.12^K F_{nc} = 0.737 × 45.7 × 20,306.2 = 683.93^K CP_c = 0.277 × 839.1 = 232.4' R_w = 6.416 × 10,867.5 × 1.28 = 89.25^K R_{nw} = 0.848 × 5,437 × 33,540.0 = 154.64^K CP_w = 0.393 × 839.1 = 329.8'	35°
0°	R_f = 11.68^K R_w = 6.416 × 10,177.5 × 1.0 = 65.30^K	R_f = 9.12^K R_w = 6.416 × 10,867.5 × 1.0 = 69.73^K	0°

22 500 DWT TANKER

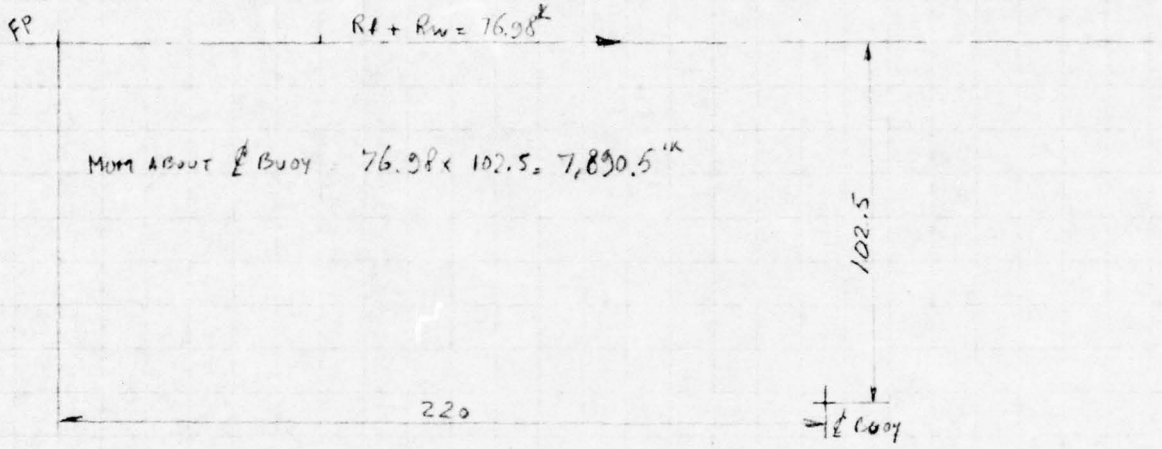
	LOADED	BALLAST
25°	$R_f = 5.45^k$ $F_{ne} = 0.547 \times 45.7 \times 18,766.1 = 469.11^k$ $CP_c = 0.337 \times 579.2 = 195.2'$ $R_w = 6.416 \times 4,952.9 \times 1.28 = 40.68^k$ $R_{nw} = 0.462 \times 5,437 \times 7,913.5 = 19.88^k$ $CP_w = 0.348 \times 579.2 = 201.6'$	$R_f = 4.11^k$ $F_{ne} = 0.462 \times 45.7 \times 10,309.8 = 217.67^k$ $CP_c = 0.328 \times 579.2 = 190.0'$ $R_w = 6.416 \times 5,268.2 \times 1.28 = 43.26^k$ $R_{nw} = 0.547 \times 5,437 \times 14,815.5 = 44.06^k$ $CP_w = 0.348 \times 579.2 = 201.6'$
30°	$R_f = 5.45^k$ $F_{ne} = 0.711 \times 45.7 \times 18,766.1 = 609.76^k$ $CP_c = 0.324 \times 579.2 = 187.7'$ $R_w = 6.416 \times 4,952.9 \times 1.3 = 41.31^k$ $R_{nw} = 0.611 \times 5,437 \times 7,913.5 = 26.29^k$ $CP_w = 0.372 \times 579.2 = 215.5'$	$R_f = 4.11^k$ $F_{ne} = 0.611 \times 45.7 \times 10,309.8 = 287.88^k$ $CP_c = 0.309 \times 579.2 = 179.0'$ $R_w = 6.416 \times 5,268.2 \times 1.3 = 43.94^k$ $R_{nw} = 0.711 \times 5,437 \times 14,815.5 = 57.27^k$ $CP_w = 0.372 \times 579.2 = 215.5'$
35°	$R_f = 5.45^k$ $F_{ne} = 0.848 \times 45.7 \times 18,766 = 727.25^k$ $CP_c = 0.301 \times 579.2 = 174.3'$ $R_w = 6.416 \times 4,952.9 \times 1.28 = 40.68^k$ $R_{nw} = 0.737 \times 5,437 \times 7,913.5 = 31.71^k$ $CP_w = 0.393 \times 579.2 = 227.6'$	$R_f = 4.11^k$ $F_{ne} = 0.737 \times 45.7 \times 10,309.8 = 347.24^k$ $CP_c = 0.277 \times 579.2 = 160.4'$ $R_w = 6,416 \times 5,268.2 \times 1.28 = 43.26^k$ $R_{nw} = 0.848 \times 5,437 \times 14,815.5 = 68.31^k$ $CP_w = 0.393 \times 579.2 = 227.6'$
0°	$R_f = 5.45^k$ $R_w = 6.416 \times 4,952.9 \times 1.0 = 31.78^k$	$R_f = 4.11^k$ $R_w = 6.416 \times 5,268.2 \times 1.0 = 33.80^k$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY MCDERMOTT & CO., INC.

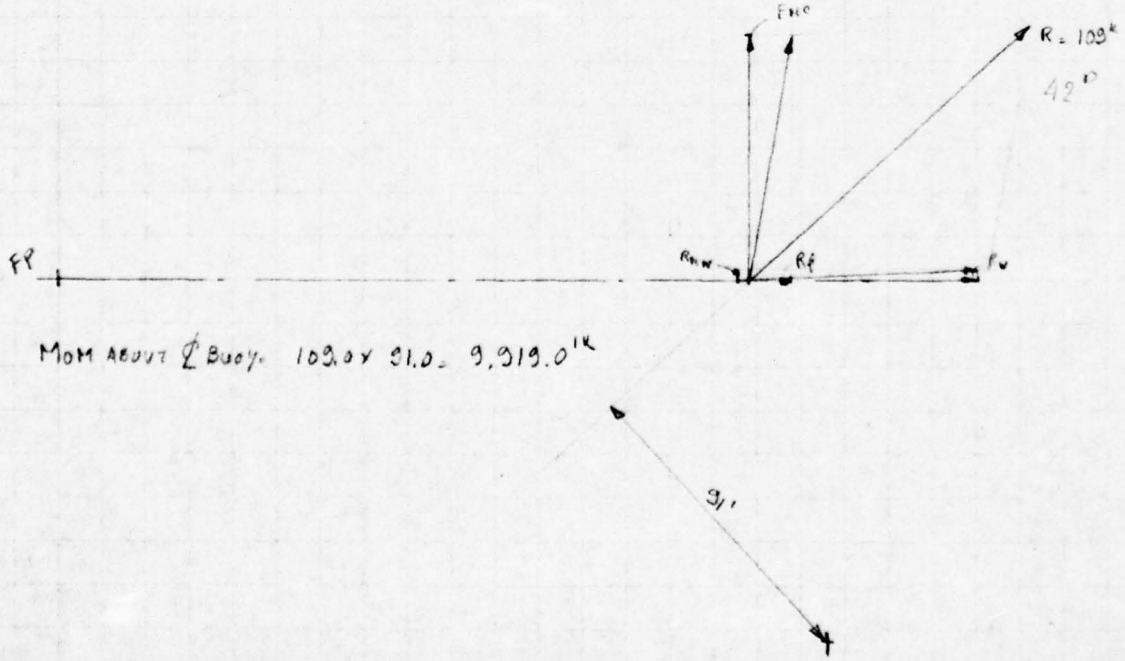
COMPANY			SHEET NO
SUBJECT: MOM ABOUT ℄ BUOY OF WIND & FRICTION RESISTANCE			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

LOADED 0°



MOM ABOUT ℄ BUOY 76.98 × 102.5 = 7,890.5ᶦᴷ

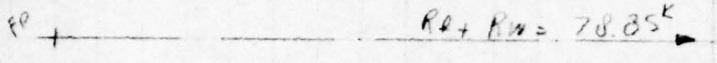
LOADED 50



MOM ABOUT ℄ BUOY 109.0 × 91.0 = 9,919.0ᶦᴷ

70,000 DWT

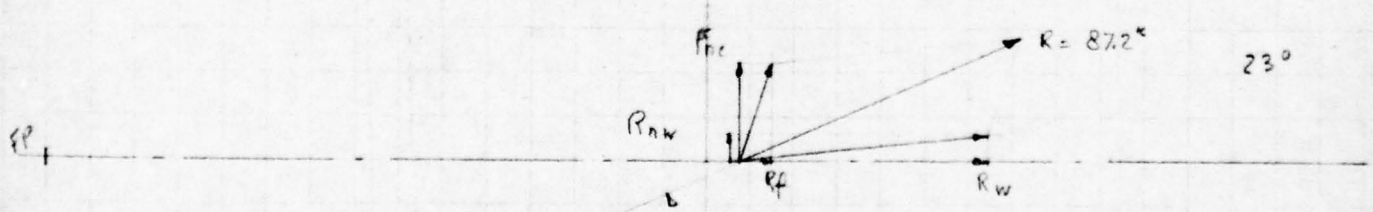
BALLAST 0°



MOM ABOUT $\mathcal{L}$ BUOY = $78.85 \times 102.5 = 8,082.1^{'K}$

$\mathcal{L}$ BUOY

BALLAST 5°



MOM ABOUT $\mathcal{L}$ BUOY = $87.2 \times 102.5 = 8,938.0^{'K}$

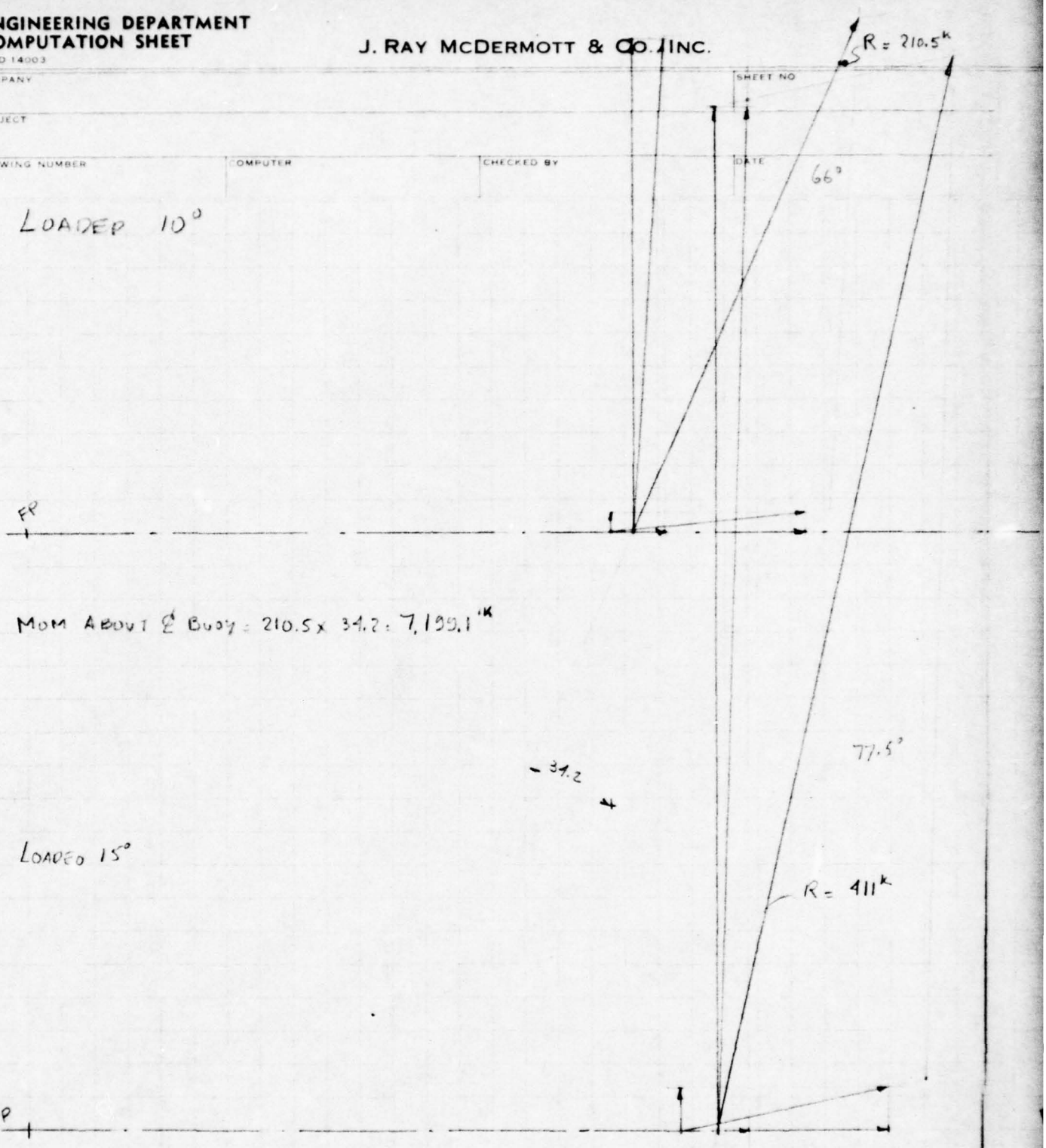
102.5

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY MCDERMOTT & CO. INC.

COMPANY | SHEET NO
SUBJECT
DRAWING NUMBER | COMPUTER | CHECKED BY | DATE

LOADED 10°



MOM ABOUT ℄ BUOY = 210.5 x 34.2 = 7,199.1 'K

LOADED 15°

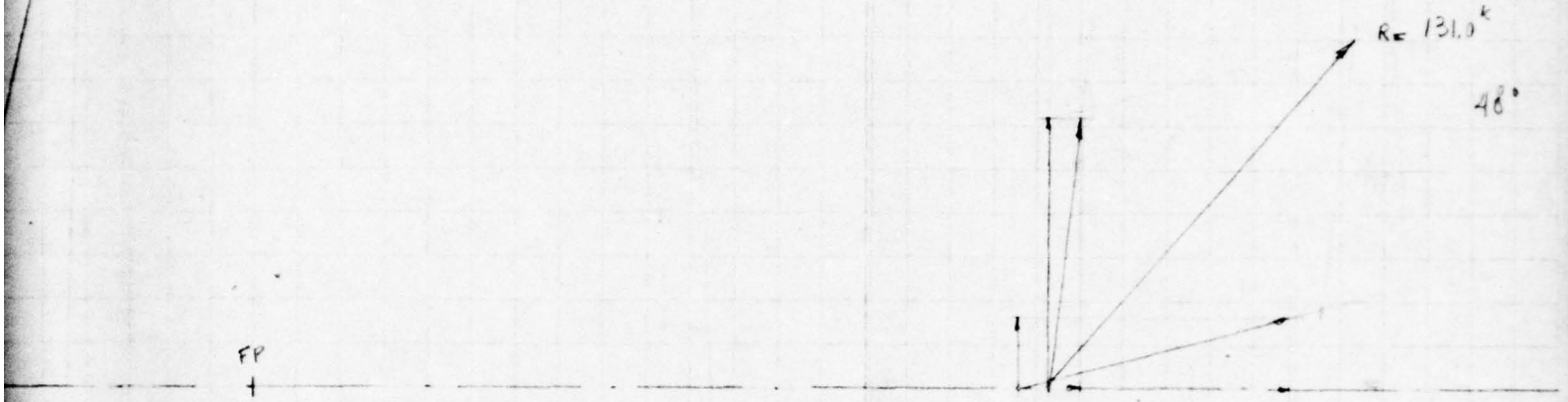
MOM ABOUT ℄ BUOY = -411.0 x -16.5 = -6,781.5 'K

+16.5

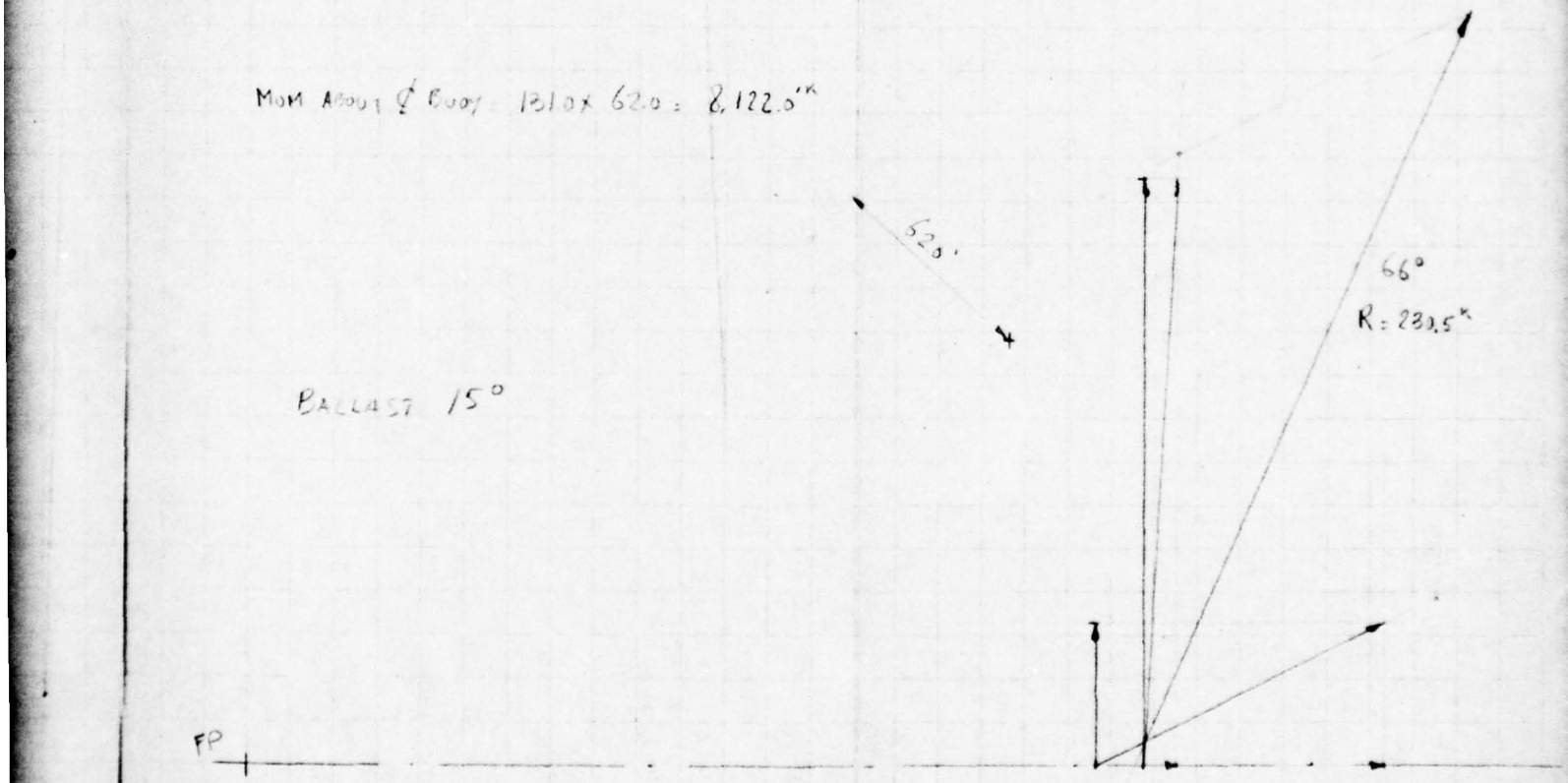
210.5ᵏ

70,000 DWT

BALLAST 10°



MOM ABOUT ℄ BUOY = 131.0 × 62.0 = 8,122.0ᵏ



BALLAST 15°

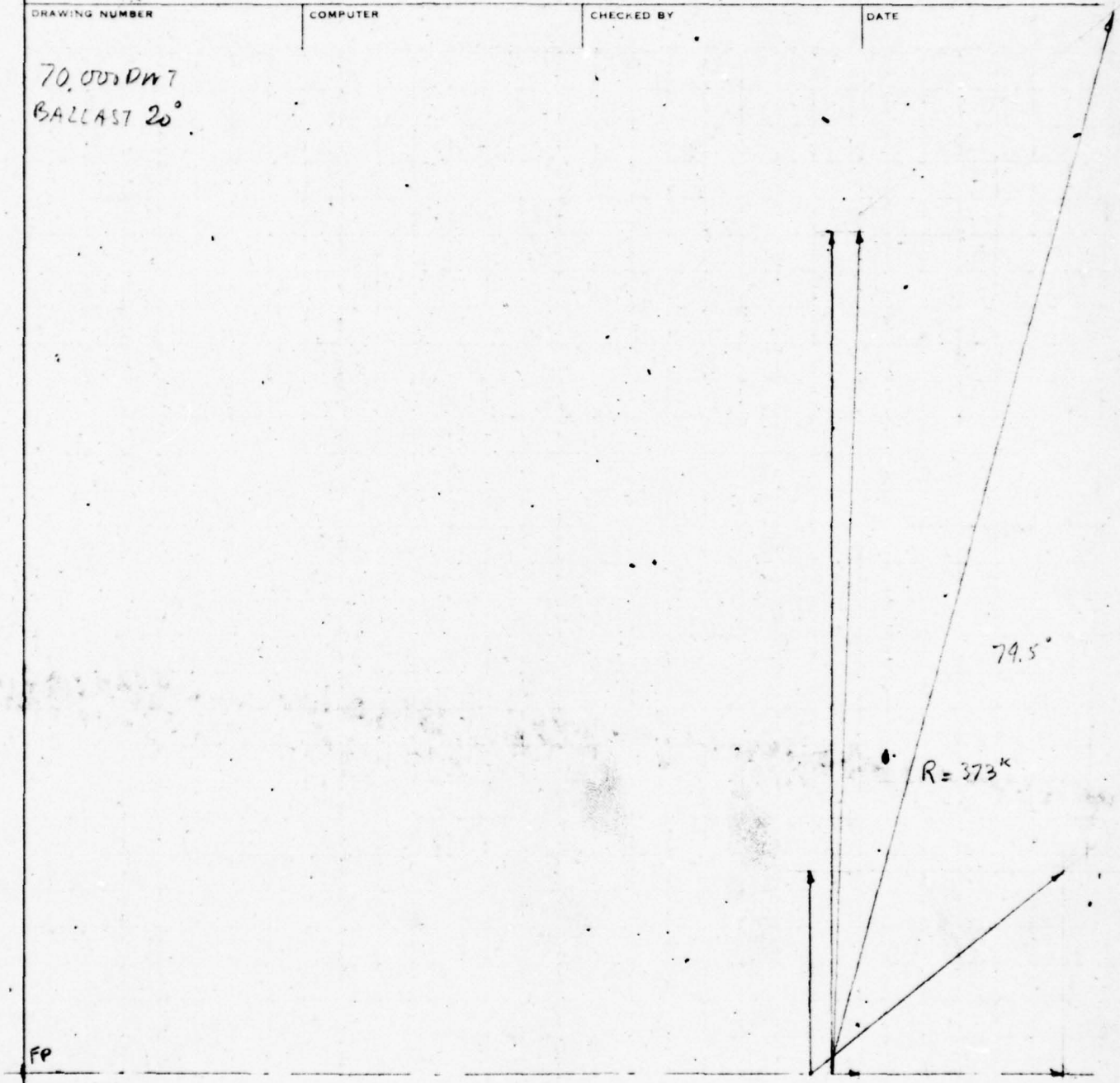
MOM ABOUT ℄ BUOY = 230.5 × 7.5 = 1,728.8ᵏ

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

70,000 DWT
BALLAST 20°



MOM ABOUT ℄ BODY = 373^K x -27.5 = -10,257.5'^K

+27.5'

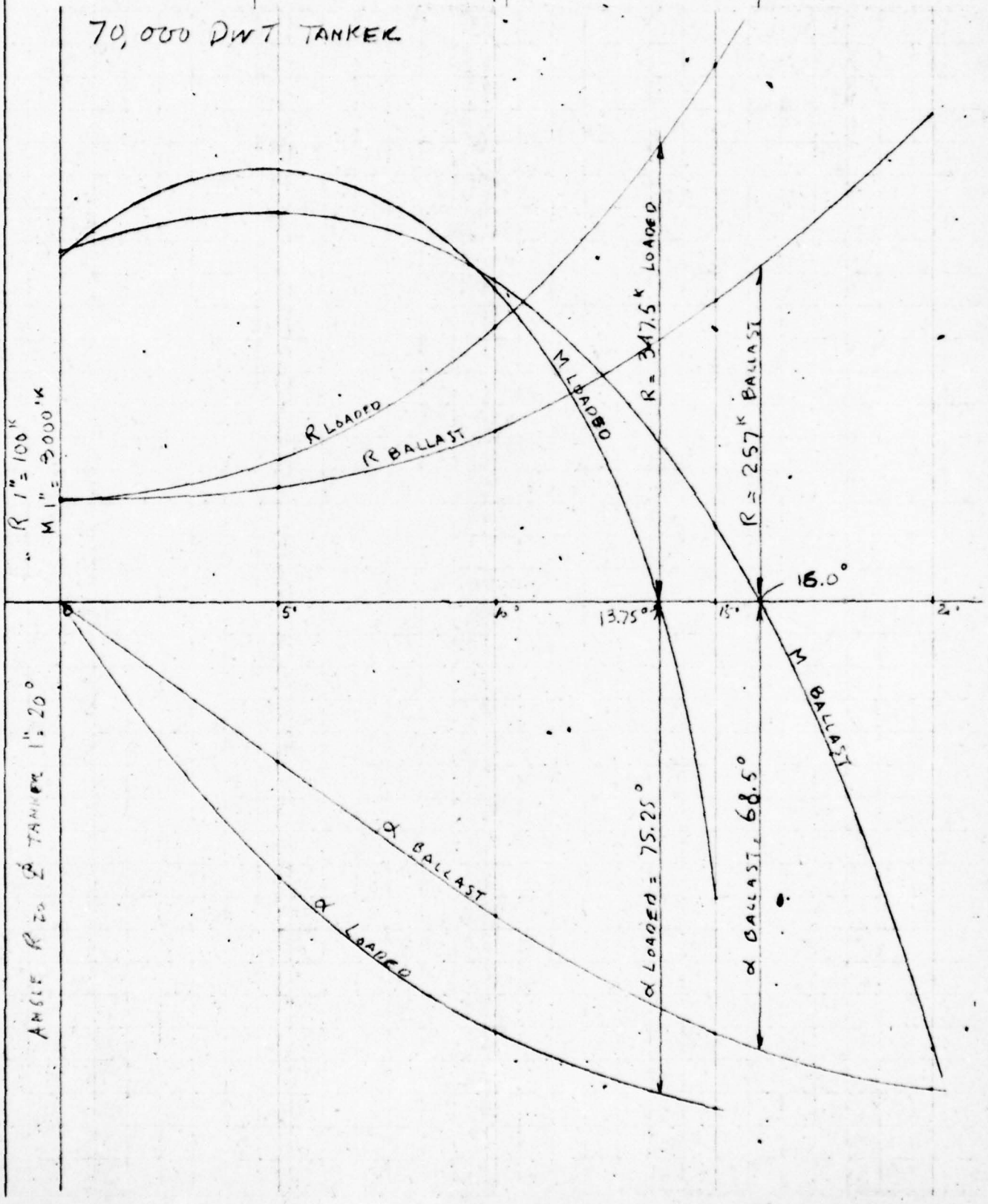
ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY | SHEET NO

SUBJECT: MIMP & FRICTION RESISTANCE MOM. ABOUT ℄ OF BUOY

DRAWING NUMBER | COMPUTER | CHECKED BY | DATE

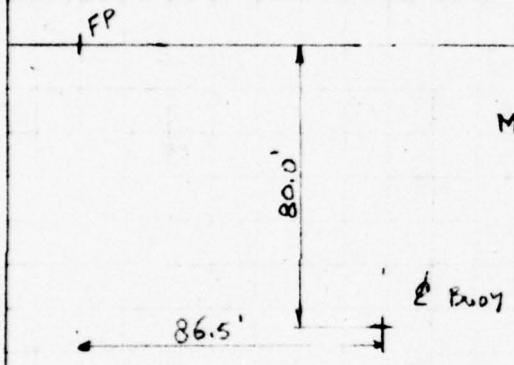


ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

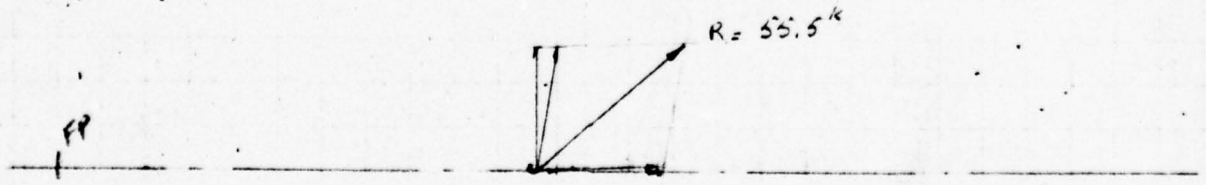
LOADED 0°



$R_f + R_w = 37.23^k$

MOM ABOUT ℄ BUOY. $37.23 \times 80.0 = 2,978.4'^k$

LOADED 5°



MOM ABOUT ℄ BUOY. $55.5 \times 27.5 = 1,526.3'^k$

22,500 DWT

BALLAST 0°

FP

RA + W = 37.21 K

MOM ABOUT ℄ BUOY = 37.21 × 80 = 3,032.8 'K

BALLAST 5°

23.5'

FP

= 49.5 K

MOM ABOUT ℄ BUOY = 49.5 × 54.5 = 2,425.3 'K

5 1/2°

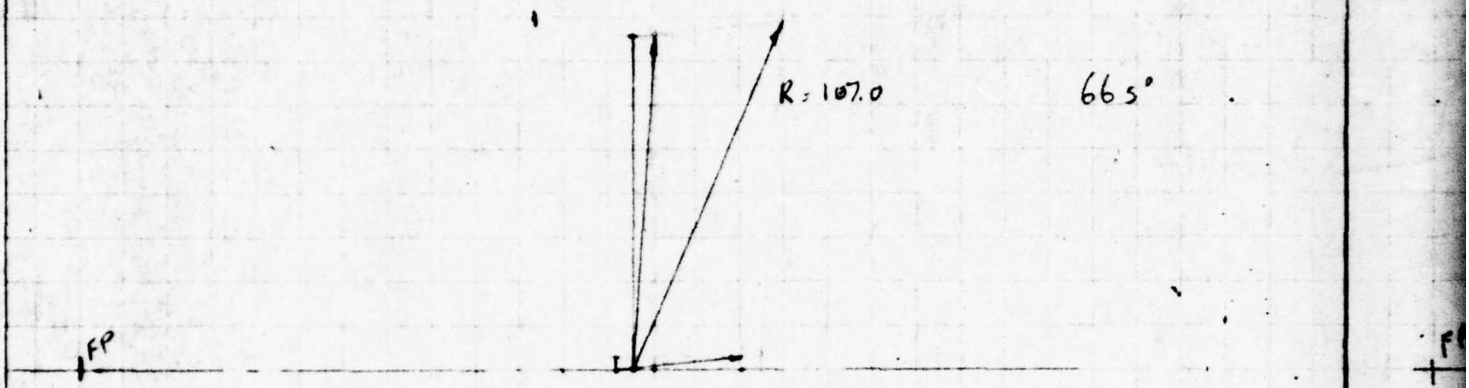
2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MED 14003

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

LOADED 10°



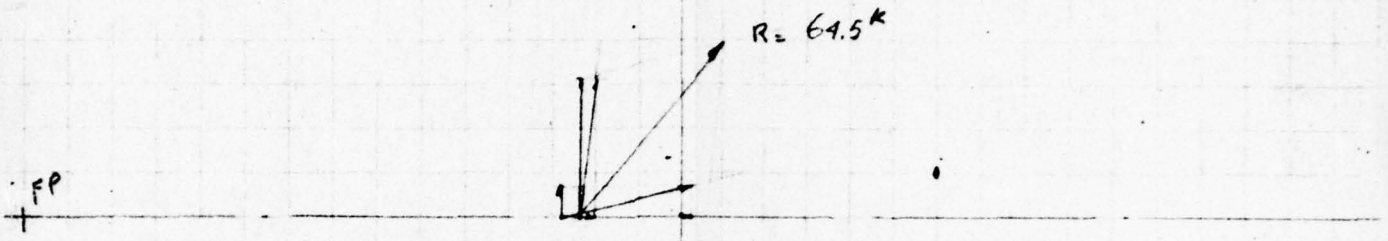
MOM' ABOUT ℄ BUOY, 107.0 × -33.2 = -3,552.4 FT-K

+ 33.2'

22,500 DWT TANKER

BALLAST 10°

49°



MOM ABOUT ℄ BUOY = 64.5 x 0 = 0

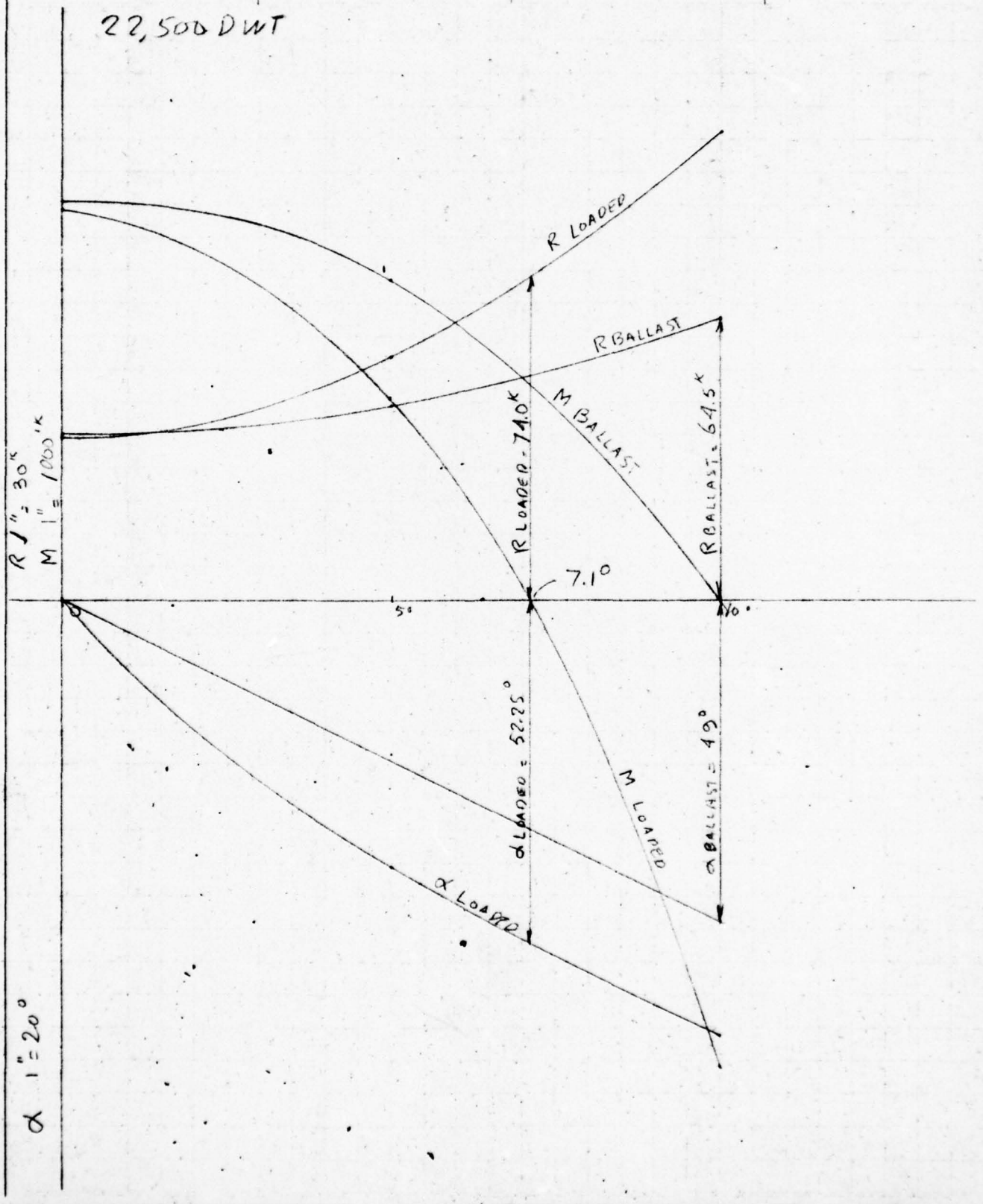
2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
McD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

22,500 DWT

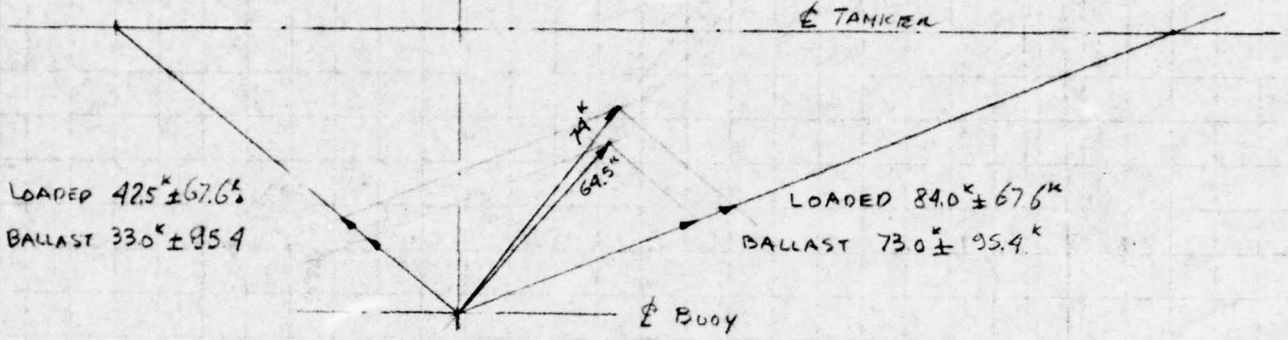


ENGINEERING DEPARTMENT
COMPUTATION SHEET
McD 5015

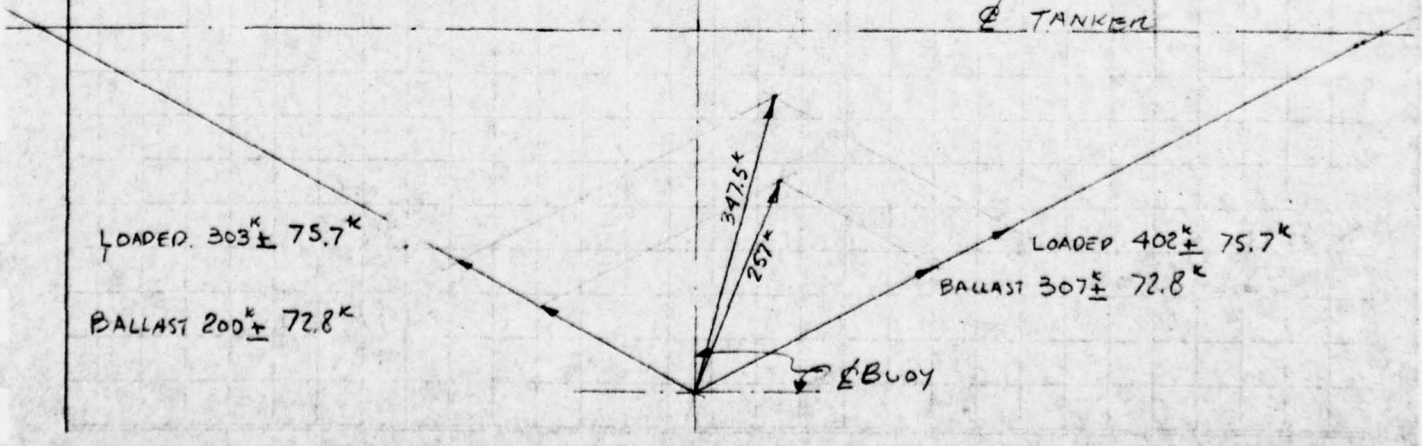
J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO.
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

22,500 DWT



70,000 DWT



ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT: TANKER PROPERTIES FOR MOTION STUDY			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

22,500 DWT LOADED	SURGE	SWAY
Δ	70,099	70,099
ADD MASS	4,766	30,549
	74,865 M = 2,325	100,648 M = 3,126
BALLAST		
Δ	35,049	35,049
ADD MASS	2,618	9,219
	37,667 M = 1,170	44,268 M = 1,375
LIGHT		
Δ	21,029	21,029
ADD MASS	1,662	3,716
	22,691 M = 705	24,745 M = 768

70,000 DWT LOADED	SURGE	SWAY
Δ	204,985	204,985
ADD MASS	14,441	81,699
	219,426 M = 6,814	286,684 M = 8,903
BALLAST		
Δ	102,493	102,493
ADD MASS	7,942	24,712
	110,435 M = 3,430	127,205 M = 3,950
LIGHT		
Δ	61,495	61,495
ADD MASS	5,054	10,010
	66,549 M = 2,067	71,505 M = 2,221

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

22,500 DWT YAW LOADED

J LIGHT SHIP		965,746,311	
J LOAD		1,104,075,000	
J ADD MASS	30,549 × 45,924.5 =	1,402,947,551	
		3,472,768,862	J = 107,849,965

BALLAST

J LIGHT SHIP		965,746,311	
J BALLAST		315,450,000	
J ADD MASS	9,219 × 45,924.5 =	423,377,966	
		1,704,574,277	J = 52,937,089

LIGHT

J LIGHT SHIP		965,746,311	
J ADD MASS	3,716 × 45,924.5 =	170,655,492	
		1,136,401,753	J = 35,291,980

70,000 DWT YAW
LOADED

J LIGHT SHIP		5,926,838,904	
J LOAD		6,775,497,357	
J ADD MASS	81,699 × 76,372.2 =	7,874,084,261	
	J = 639,019,271	20,576,420,522	

BALLAST

J LIGHT SHIP		5,926,838,904	
J BALLAST		1,939,996,661	
J ADD MASS	24,712 × 76,372.2 =	2,381,722,790	
	J = 318,278,210	10,298,558,355	

LIGHT

J LIGHT SHIP		5,926,838,904	
J ADD MASS	10,010 × 76,372.2 =	964,755,792	
	J = 214,029,680	6,891,594,696	

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

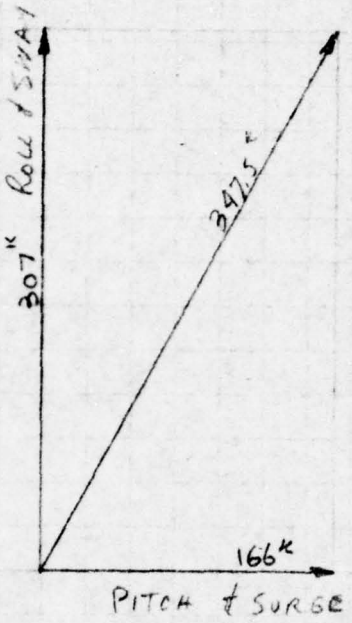
J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

70,000 LOADED

60'WD
$T_{S_2} = 8.2$
$T_{S_3} = 6.8$
$T_{S_4} = 6.8$
$T_{S_5} = 3.8$

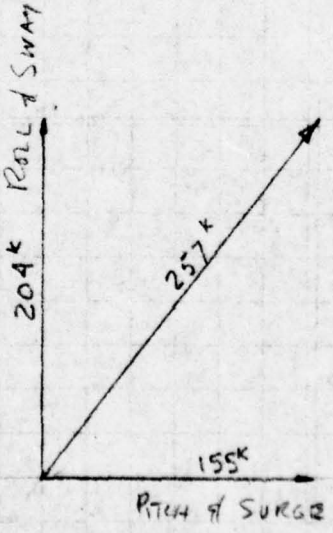
150'WD
$T_{S_2} = 7.6$
$T_{S_3} = 6.5$
$T_{S_4} = 8.5$
$T_{S_5} = 4.8$



70,000 BALLAST

60'WD
$T_{S_2} = 8.4$
$T_{S_3} = 7.8$
$T_{S_4} = 7.3$
$T_{S_5} = 5.8$

150'WD
$T_{S_2} = 7.7$
$T_{S_3} = 7.2$
$T_{S_4} = 8.8$
$T_{S_5} = 7.1$



ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY	SHEET NO
SUBJECT	

DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

22,500 DWT LOADED

60'WD

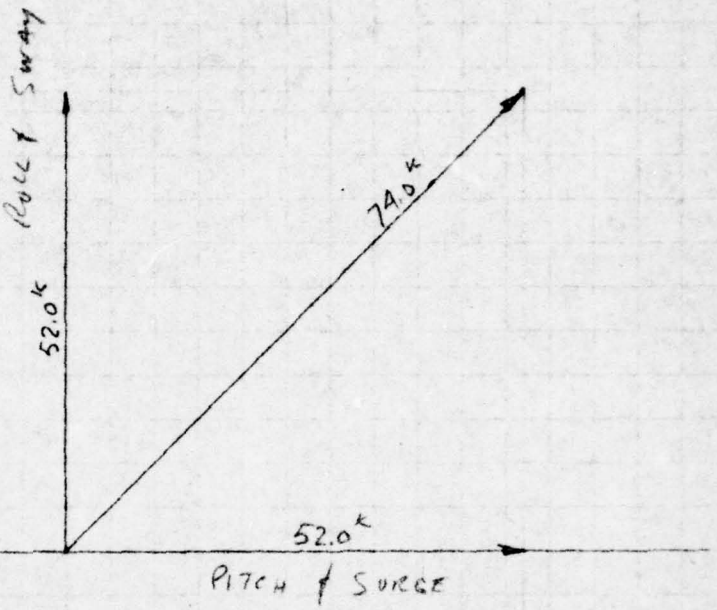
$T_{S_2} = 10.4$ $T_{S_4} = 12.5$

$T_{S_3} = 10.4$ $T_{S_5} = 12.5$

150'WD

$T_{S_2} = 9.2$ $T_{S_4} = 14.3$

$T_{S_3} = 9.2$ $T_{S_5} = 14.3$



28,500 DWT BALLAST

60'WD

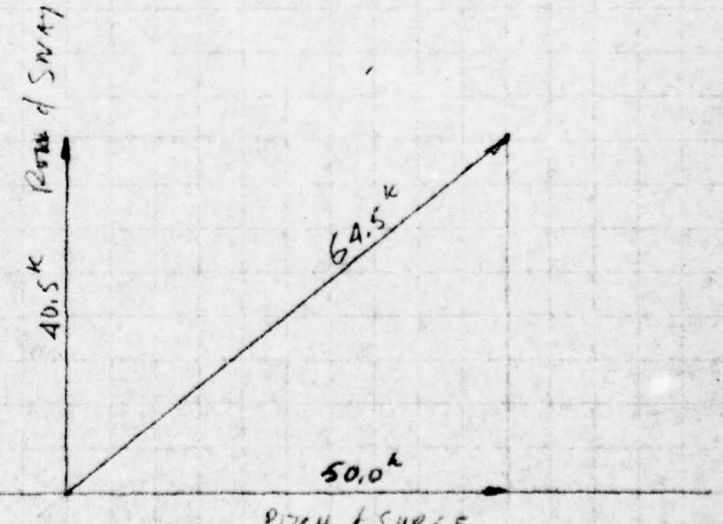
$T_{S_2} = 10.4$ $T_{S_4} = 12.6$

$T_{S_3} = 10.7$ $T_{S_5} = 13.3$

150'WD

$T_{S_2} = 9.2$ $T_{S_4} = 14.3$

$T_{S_3} = 9.4$ $T_{S_5} = 15.1$



ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY	SHEET NO.

SUBJECT: TANKER COMPUTER INPUT FOR MOTION STUDY

DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

DWT 22,500
LOADED L = 579.2 B = 77.0
DISPL = 70,099 M_1 = 2,325 M_2 = 3,126 M_3 = 107,849,965
Tw = 10.0 H = 10.0
E = 7.1°
T_{S1} = 8.20 T_{S2} = 10.00 T_{S3} = 10.20 T_{S4} = 14.14 T_{S5} = 14.14 T_{S6} = 14.14
X = 200.00 Y = 25.0 A = 0.00

BALLAST L = 579.2 B = 77.0
DISPL = 35,049 M_1 = 1,170 M_2 = 1,375 M_3 = 52,937,089
Tw = 10.0 H = 10.0
E = 10.0°
T_{S1} = 7.00 T_{S2} = 10.40 T_{S3} = 9.30 T_{S4} = 14.14 T_{S5} = 14.14 T_{S6} = 14.14
X = 200.00 Y = 25.00 A = 0.00

DWT 70,000
LOADED L = 839.1 B = 115.0
DISPL = 204,985 M_1 = 6,814 M_2 = 8,903 M_3 = 639,019 271
Tw = 12.00 H = 10.0
E = 13.75°
T_{S1} = 9.80 T_{S2} = 12.00 T_{S3} = 12.00 T_{S4} = 14.14 T_{S5} = 14.14 T_{S6} = 16.97
X = 200.0 Y = 57.0 A = 0.0

BALLAST L = 839.1 B = 115.0
DISPL = 102,493 M_1 = 3,430 M_2 = 3,950 M_3 = 318,278,210
Tw = 12.0 H = 10.0
E = 16.0°
T_{S1} = 8.40 T_{S2} = 12.50 T_{S3} = 11.80 T_{S4} = 14.14 T_{S5} = 14.14 T_{S6} = 16.97
X = 200.0 Y = 57.0 A = 0.0

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY	SHEET NO.

SUBJECT: BUOY COMPUTER INPUT FOR MOTION STUDY

DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

BUOY (70,000 DWT TANKER LOADED)

D = 40.0
W.D = 60.0
DISPL = 1,347.4 M_1 = 83.7 M_2 = 83.7 M_3 = 1.0
Tw = 12.0 H = 10.0
E = 13.75 X = 0.0 Y = 0.0 A = 200.0
T_{S1} = 9.65 T_{S2} = 8.2 T_{S3} = 6.8 T_{S4} = 6.8 T_{S5} = 3.8 T_{S6} = 16.97

W.D = 150
DISPL = 1,350.7 M_1 = 84.3 M_2 = 84.3 M_3 = 1.0
Tw = 12.0 H = 10.0
E = 13.75 X = 0.0 Y = 0.0 A = 200.0
T_{S1} = 9.80 T_{S2} = 7.6 T_{S3} = 6.5 T_{S4} = 8.5 T_{S5} = 4.8 T_{S6} = 16.97

BUOY (20,000 DWT TANKER BALLAST)

D = 40.0
W.D = 60.0
DISPL = 1,347.4 M_1 = 83.7 M_2 = 83.7 M_3 = 1.0
Tw = 12.0 H = 10.0
E = 16.0 X = 0.0 Y = 0.0 A = 200.0
T_{S1} = 9.65 T_{S2} = 8.1 T_{S3} = 7.8 T_{S4} = 7.3 T_{S5} = 5.8 T_{S6} = 16.97

W.D = 150
DISPL = 1,350.7 M_1 = 84.3 M_2 = 84.3 M_3 = 1.0
Tw = 12.0 H = 10.0
E = 16.0 X = 0.0 Y = 0.0 A = 200.0
T_{S1} = 9.80 T_{S2} = 7.7 T_{S3} = 7.2 T_{S4} = 8.8 T_{S5} = 7.1 T_{S6} = 16.97

BUOY (22,500 DWT TANKER LOADED)

D = 40.0
W.D. 60.0
DISPL = 1,347.4 M_1 = 83.7 M_2 = 83.7 M_3 = 1.0
Tw = 10.0 H = 10.0
E = 7.1 X = 0.0 Y = 0.0 A = 200.0
T_{S1} = 9.65 T_{S2} = 10.40 T_{S3} = 10.40 T_{S4} = 12.50 T_{S5} = 12.50 T_{S6} = 14.14

WD = 150.0
DISPL = 1,350.7 M_1 = 84.3 M_2 = 84.3 M_3 = 1.0
Tw = 10.0 H = 10.0
E = 7.1 X = 0.0 Y = 0.0 A = 200.0
T_{S1} = 9.80 T_{S2} = 9.2 T_{S3} = 9.2 T_{S4} = 14.30 T_{S5} = 14.30 T_{S6} = 14.14

BUOY (22,500 DWT TANKER BALLAST)

D = 40.0
W.D. 60.0
DISPL = 1,347.4 M_1 = 83.7 M_2 = 83.7 M_3 = 1.0
Tw = 10.0 H = 10.0
E = 10.0 X = 0.0 Y = 0.0 A = 200.0
T_{S1} = 9.65 T_{S2} = 10.40 T_{S3} = 10.70 T_{S4} = 12.60 T_{S5} = 13.30 T_{S6} = 14.14

WD = 150.0
DISPL = 1,350.7 M_1 = 84.3 M_2 = 84.3 M_3 = 1.0
Tw = 10.0 H = 10.0
E = 10.0 X = 0.0 Y = 0.0 A = 200.0
T_{S1} = 9.80 T_{S2} = 9.20 T_{S3} = 9.40 T_{S4} = 14.30 T_{S5} = 15.10 T_{S6} = 14.14

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 8015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO CASE 1a
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

D = 40.0 (46,000 DWT TANKER) LIGHT)

W.O = 150
DISPL = 1,350.7 M_1 = 84.3 M_2 = 84.3 M_3 = 1.0

T_w = 11.0 H = 10.0

E = 0.0 X = -16.0 Y = 0.0 A = 459.0
T_{S1} = 9.8 T_{S2} = 9.95 T_{S3} = 10.8 T_{S4} = 15.05 T_{S5} = 21.7 T_{S6} = 1.0

E = 10.0 X = 0.0 Y = -16.0 A = 269.25
T_{S1} = 9.8 T_{S2} = 9.15 T_{S3} = 9.6 T_{S4} = 13.9 T_{S5} = 19.2 T_{S6} = 1.0

E = 20.0 X = 0.0 Y = -16.0 A = 179.5
T_{S1} = 9.8 T_{S2} = 8.45 T_{S3} = 8.75 T_{S4} = 11.45 T_{S5} = 11.1 T_{S6} = 1.0

E = 30.0 X = 0.0 Y = -16.0 A = 89.75
T_{S1} = 9.8 T_{S2} = 7.8 T_{S3} = 9.0 T_{S4} = 9.25 T_{S5} = 12.0 T_{S6} = 1.0

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 11.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 0.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.20	6.22	0.00	2.73	0.00	0.00
0.0 DEGREE AMPLITUDE	-5.49	-4.83	0.00	-1.48	0.00	0.00
30.0 DEGREE AMPLITUDE	-1.70	-6.15	0.00	-.13	0.00	0.00
60.0 DEGREE AMPLITUDE	2.53	-5.81	0.00	1.24	0.00	0.00
90.0 DEGREE AMPLITUDE	6.09	-3.92	0.00	2.29	0.00	0.00
120.0 DEGREE AMPLITUDE	8.02	-.97	0.00	2.72	0.00	0.00
150.0 DEGREE AMPLITUDE	7.80	2.23	0.00	2.43	0.00	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-1.4817	0.0000	-4.1432
30.0 DEGREE DISPLACEMENT	-.1352	0.0000	.0082
60.0 DEGREE DISPLACEMENT	1.2476	0.0000	4.1575
90.0 DEGREE DISPLACEMENT	2.2961	0.0000	7.1927
120.0 DEGREE DISPLACEMENT	2.7293	0.0000	8.3007
150.0 DEGREE DISPLACEMENT	2.4313	0.0000	7.1845

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 11.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 10.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.20	5.93	1.10	3.48	.57	0.00
0.0 DEGREE AMPLITUDE	-3.53	4.97	.99	-2.28	-.35	0.00
30.0 DEGREE AMPLITUDE	-6.76	2.69	.61	-3.29	-.53	0.00
60.0 DEGREE AMPLITUDE	-8.18	-.30	.07	-3.41	-.56	0.00
90.0 DEGREE AMPLITUDE	-7.40	-3.23	-.48	-2.63	-.44	0.00
120.0 DEGREE AMPLITUDE	-4.65	-5.28	-.91	-1.13	-.20	0.00
150.0 DEGREE AMPLITUDE	-.64	-5.92	-1.10	.66	.08	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-2.2824	-.3596	-3.8105
30.0 DEGREE DISPLACEMENT	-3.2917	-.5339	-6.9370
60.0 DEGREE DISPLACEMENT	-3.4189	-.5651	-8.2047
90.0 DEGREE DISPLACEMENT	-2.6301	-.4449	-7.2740
120.0 DEGREE DISPLACEMENT	-1.1365	-.2054	-4.3942
150.0 DEGREE DISPLACEMENT	.6615	.0890	-.3369

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 11.000 SECONDS , WAVE HEIGHT 10.000 FEET

HEADING ANGLE 30.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.21	4.33	2.98	5.06	2.83	0.00
0.0 DEGREE AMPLITUDE	8.16	2.11	.83	1.28	1.99	0.00
30.0 DEGREE AMPLITUDE	6.58	3.72	2.15	3.56	.72	0.00
60.0 DEGREE AMPLITUDE	3.24	4.33	2.89	4.88	-.73	0.00
90.0 DEGREE AMPLITUDE	-.96	3.78	2.86	4.89	-2.00	0.00
120.0 DEGREE AMPLITUDE	-4.91	2.22	2.06	3.59	-2.73	0.00
150.0 DEGREE AMPLITUDE	-7.54	.06	.70	1.33	-2.73	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	1.2878	1.9973	7.9269
30.0 DEGREE DISPLACEMENT	3.5626	.7261	5.9842
60.0 DEGREE DISPLACEMENT	4.8828	-.7395	2.4381
90.0 DEGREE DISPLACEMENT	4.8946	-2.0071	-1.7613
120.0 DEGREE DISPLACEMENT	3.5949	-2.7368	-5.4888
150.0 DEGREE DISPLACEMENT	1.3319	-2.7332	-7.7456

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 11.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 20.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.21	5.16	1.97	5.91	2.25	0.00
0.0 DEGREE AMPLITUDE	4.16	5.00	1.88	-1.94	-1.03	0.00
30.0 DEGREE AMPLITUDE	.07	4.96	1.92	-4.47	-1.89	0.00
60.0 DEGREE AMPLITUDE	-4.04	3.60	1.46	-5.81	-2.25	0.00
90.0 DEGREE AMPLITUDE	-7.07	1.27	.60	-5.59	-2.00	0.00
120.0 DEGREE AMPLITUDE	-8.21	-1.40	-.42	-3.87	-1.21	0.00
150.0 DEGREE AMPLITUDE	-7.14	-3.69	-1.32	-1.11	-.10	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-1.9412	-1.0327	3.6426
30.0 DEGREE DISPLACEMENT	-4.4766	-1.8960	-.4672
60.0 DEGREE DISPLACEMENT	-5.8124	-2.2512	-4.4518
90.0 DEGREE DISPLACEMENT	-5.5908	-2.0032	-7.2436
120.0 DEGREE DISPLACEMENT	-3.8711	-1.2185	-8.0945
150.0 DEGREE DISPLACEMENT	-1.1141	-.1072	-6.7764

ENGINEERING DEPARTMENT
COMPUTATION SHEET
McD 5013

J. RAY McDERMOTT & CO., INC.

COMPANY		SHEET NO. CASE 6
SUBJECT		
DRAWING NUMBER	COMPUTER	CHECKED BY / DATE

D = 40.0 (16,000 DWT TANKER LIGHT)

W.D. = 60.0
DISPL = 1.347.9 M_1 = 83.7 M_2 = 83.7 M_3 = 1.0

T_W = 11.0 H = 100

E = 0.0 X = −16.0 Y = 0.0 A = 459.0
T_{S1} = 9.65 T_{S2} = 10.70 T_{S3} = 12.80 T_{S4} = 13.2 T_{S5} = 13.10 T_{S6} = 1.0

E = 10.0 X = 0.0 Y = −16.0 A = 869.25
T_{S1} = 9.65 T_{S2} = 10.3 T_{S3} = 10.90 T_{S4} = 12.2 T_{S5} = 12.75 T_{S6} = 1.0

E = 20.0 X = 0.0 Y = −16.0 A = 170.5
T_{S1} = 9.65 T_{S2} = 9.9 T_{S3} = 9.75 T_{S4} = 10.0 T_{S5} = 9.60 T_{S6} = 1.0

E = 30.0 X = 0.0 X = −16.0 A = 89.75
T_{S1} = 9.65 T_{S2} = 8.55 T_{S3} = 10.05 T_{S4} = 7.7 T_{S5} = 10.45 T_{S6} = 1.0

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 11.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 0.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-
MAXIMUM AMPLITUDE	8.20	6.54	0.00	4.22	0.00
0.0 DEGREE AMPLITUDE	-5.31	-3.13	0.00	-1.47	0.00
30.0 DEGREE AMPLITUDE	-1.48	-5.58	0.00	.69	0.00
60.0 DEGREE AMPLITUDE	2.75	-6.54	0.00	2.68	0.00
90.0 DEGREE AMPLITUDE	6.24	-5.74	0.00	3.95	0.00
120.0 DEGREE AMPLITUDE	8.06	-3.40	0.00	4.16	0.00
150.0 DEGREE AMPLITUDE	7.72	-.15	0.00	3.25	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-1.4799	0.0000	-4.4420
30.0 DEGREE DISPLACEMENT	.6963	0.0000	.0781
60.0 DEGREE DISPLACEMENT	2.6859	0.0000	4.5774
90.0 DEGREE DISPLACEMENT	3.9559	0.0000	7.8501
120.0 DEGREE DISPLACEMENT	4.1658	0.0000	9.0194
150.0 DEGREE DISPLACEMENT	3.2596	0.0000	7.7720

DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

60.000 FEET

SECONDS WAVE HEIGHT 10.000 FEET

DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
	8.20	6.54	0.00	4.22	0.00	0.00
TUDE	-5.31	-3.13	0.00	-1.47	0.00	0.00
TUDE	-1.48	-5.58	0.00	.69	0.00	0.00
TUDE	2.75	-6.54	0.00	2.68	0.00	0.00
TUDE	6.24	-5.74	0.00	3.95	0.00	0.00
TUDE	8.06	-3.40	0.00	4.16	0.00	0.00
TUDE	7.72	-.15	0.00	3.25	0.00	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
CEMENT	-1.4799	0.0000	-4.4420
CEMENT	.6963	0.0000	.0781
CEMENT	2.6859	0.0000	4.5774
CEMENT	3.9559	0.0000	7.8501
CEMENT	4.1658	0.0000	9.0194
CEMENT	3.2596	0.0000	7.7720

2

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 11.000 SECONDS WAVE HEIGHT 20.000 FEET

HEADING ANGLE 10.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-
MAXIMUM AMPLITUDE	8.20	6.46	1.13	5.34	.88
0.0 DEGREE AMPLITUDE	-3.73	6.28	1.13	-4.64	-.73
30.0 DEGREE AMPLITUDE	-6.88	4.67	.95	-5.34	-.88
60.0 DEGREE AMPLITUDE	-8.19	1.81	.52	-4.61	-.79
90.0 DEGREE AMPLITUDE	-7.30	-1.53	-.04	-2.64	-.49
120.0 DEGREE AMPLITUDE	-4.45	-4.46	-.60	.03	-.05
150.0 DEGREE AMPLITUDE	-.41	-6.20	-1.00	2.70	.39

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-4.6474	-.7388	-4.0547
30.0 DEGREE DISPLACEMENT	-5.3457	-.8853	-7.1563
60.0 DEGREE DISPLACEMENT	-4.6116	-.7945	-8.3403
90.0 DEGREE DISPLACEMENT	-2.6418	-.4908	-7.2895
120.0 DEGREE DISPLACEMENT	.0358	-.0556	-4.2855
150.0 DEGREE DISPLACEMENT	2.7038	.3944	-.1332

DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

60.000 FEET

ECONDS WAVE HEIGHT 10.000 FEET

DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
	8.20	6.46	1.13	5.34	.88	0.00
DE	-3.73	6.28	1.13	-4.64	-.73	0.00
DE	-6.88	4.67	.95	-5.34	-.88	0.00
DE	-8.19	1.81	.52	-4.61	-.79	0.00
DE	-7.30	-1.53	-.04	-2.64	-.49	0.00
DE	-4.45	-4.46	-.60	.03	-.05	0.00
DE	-.41	-6.20	-1.00	2.70	.39	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
EMENT	-4.6474	-.7388	-4.0547
EMENT	-5.3457	-.8853	-7.1563
EMENT	-4.6116	-.7945	-8.3403
EMENT	-2.6418	-.4908	-7.2895
EMENT	.0358	-.0556	-4.2855
EMENT	2.7038	.3944	-.1332

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J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 11.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 20.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.20	5.82	2.20	6.15	2.12	0.00
0.0 DEGREE AMPLITUDE	3.96	5.20	1.86	4.94	1.86	0.00
30.0 DEGREE AMPLITUDE	-.16	5.81	2.20	6.11	2.12	0.00
60.0 DEGREE AMPLITUDE	-4.24	4.86	1.95	5.65	1.81	0.00
90.0 DEGREE AMPLITUDE	-7.18	2.61	1.18	3.67	1.01	0.00
120.0 DEGREE AMPLITUDE	-8.20	-.33	.09	.70	-.05	0.00
150.0 DEGREE AMPLITUDE	-7.02	-3.19	-1.02	-2.44	-1.10	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	4.9407	1.8674	3.4437
30.0 DEGREE DISPLACEMENT	6.1148	2.1252	-.7755
60.0 DEGREE DISPLACEMENT	5.6504	1.8136	-4.7871
90.0 DEGREE DISPLACEMENT	3.6720	1.0160	-7.5159
120.0 DEGREE DISPLACEMENT	.7097	-.0537	-8.2309
150.0 DEGREE DISPLACEMENT	-2.4427	-1.1092	-6.7403

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 11.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 30.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.21	4.82	3.28	3.83	3.38	0.00
0.0 DEGREE AMPLITUDE	8.12	1.79	-.02	2.03	-.57	0.00
30.0 DEGREE AMPLITUDE	6.44	3.79	1.61	3.38	1.17	0.00
60.0 DEGREE AMPLITUDE	3.03	4.77	2.83	3.83	2.60	0.00
90.0 DEGREE AMPLITUDE	-1.19	4.48	3.28	3.25	3.33	0.00
120.0 DEGREE AMPLITUDE	-5.09	2.98	2.85	1.80	3.17	0.00
150.0 DEGREE AMPLITUDE	-7.63	.68	1.66	-.13	2.16	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	2.0319	-.5701	8.1320
30.0 DEGREE DISPLACEMENT	3.3870	1.1741	5.9883
60.0 DEGREE DISPLACEMENT	3.8345	2.6038	2.2401
90.0 DEGREE DISPLACEMENT	3.2545	3.3358	-2.1083
120.0 DEGREE DISPLACEMENT	1.8025	3.1739	-5.8918
150.0 DEGREE DISPLACEMENT	-.1325	2.1616	-8.0966

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO. CASE ✓
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

D. 40.0 (46000 DWT TANKER LOADED)

W D. = 60.0
DISPL = 1,347.9 M_1 = 83.7 M_2 = 83.7 M_3 = 1.0

Tw = 11.0 H = 10.0

E 0.0 X = −16.0 Y = 0.0 A = 459.0
T_{S1} = 9.65 T_{S2} = 11.10 T_{S3} = 12.8 T_{S4} = 14.3 T_{S5} = 19.10 T_{S6} = 1.0

E = 10.0 X = 0.0 Y = −16.0 A = 269.25
T_{S1} = 9.65 T_{S2} = 10.55 T_{S3} = 9.00 T_{S4} = 12.7 T_{S5} = 7.55 T_{S6} = 1.0

E = 20.0 X = 0.0 Y = −16.0 A = 179.5
T_{S1} = 9.65 T_{S2} = 9.55 T_{S3} = 7.40 T_{S4} = 10.9 T_{S5} = 4.05 T_{S6} = 1.0

E = 30.0 X = 0.0 Y = −16.0 A = 89.75
T_{S1} = 9.65 T_{S2} = 8.4 T_{S3} = 7.80 T_{S4} = 7.3 T_{S5} = 4.80 T_{S6} = 1.0

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 11.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 0.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.20	6.38	0.00	3.23	0.00	0.00
0.0 DEGREE AMPLITUDE	-5.31	2.29	0.00	-1.57	0.00	0.00
30.0 DEGREE AMPLITUDE	-1.48	4.96	0.00	.04	0.00	0.00
60.0 DEGREE AMPLITUDE	2.75	6.31	0.00	1.65	0.00	0.00
90.0 DEGREE AMPLITUDE	6.24	5.96	0.00	2.82	0.00	0.00
120.0 DEGREE AMPLITUDE	8.06	4.01	0.00	3.23	0.00	0.00
150.0 DEGREE AMPLITUDE	7.72	.99	0.00	2.77	0.00	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-1.5762	0.0000	-5.9578
30.0 DEGREE DISPLACEMENT	.0471	0.0000	-2.8689
60.0 DEGREE DISPLACEMENT	1.6579	0.0000	.9887
90.0 DEGREE DISPLACEMENT	2.8244	0.0000	4.5814
120.0 DEGREE DISPLACEMENT	3.2341	0.0000	6.9465
150.0 DEGREE DISPLACEMENT	2.7772	0.0000	7.4503

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 11.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 10.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.20	6.46	1.03	4.72	.74	0.00
0.0 DEGREE AMPLITUDE	-3.73	6.38	.84	-3.76	.46	0.00
30.0 DEGREE AMPLITUDE	-6.88	5.02	.43	-4.68	.10	0.00
60.0 DEGREE AMPLITUDE	-8.19	2.32	-.09	-4.35	-.27	0.00
90.0 DEGREE AMPLITUDE	-7.30	-1.00	-.59	-2.85	-.58	0.00
120.0 DEGREE AMPLITUDE	-4.45	-4.06	-.93	-.58	-.74	0.00
150.0 DEGREE AMPLITUDE	-.41	-6.03	-1.03	1.83	-.69	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-3.7667	.4634	-3.9748
30.0 DEGREE DISPLACEMENT	-4.6880	.1069	-7.0104
60.0 DEGREE DISPLACEMENT	-4.3532	-.2781	-8.1376
90.0 DEGREE DISPLACEMENT	-2.8519	-.5887	-7.1363
120.0 DEGREE DISPLACEMENT	-.5865	-.7416	-4.1928
150.0 DEGREE DISPLACEMENT	1.8360	-.6957	-.1258

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 11.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 20.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.20	5.91	1.63	6.34	.97	0.00
0.0 DEGREE AMPLITUDE	3.96	5.16	1.62	4.42	.97	0.00
30.0 DEGREE AMPLITUDE	-.16	5.91	1.47	6.10	.78	0.00
60.0 DEGREE AMPLITUDE	-4.24	5.07	.93	6.14	.38	0.00
90.0 DEGREE AMPLITUDE	-7.18	2.87	.14	4.54	-.11	0.00
120.0 DEGREE AMPLITUDE	-8.20	-.09	-.68	1.71	-.58	0.00
150.0 DEGREE AMPLITUDE	-7.02	-3.03	-1.33	-1.56	-.89	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	4.4291	.9715	3.5104
30.0 DEGREE DISPLACEMENT	6.1072	.7852	-.5730
60.0 DEGREE DISPLACEMENT	6.1490	.3885	-4.5029
90.0 DEGREE DISPLACEMENT	4.5431	-.1122	-7.2263
120.0 DEGREE DISPLACEMENT	1.7199	-.5829	-8.0133
150.0 DEGREE DISPLACEMENT	-1.5641	-.8974	-6.6532

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 11.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 30.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.21	4.72	2.52	3.59	1.52	0.00
0.0 DEGREE AMPLITUDE	8.12	1.88	1.22	2.03	1.03	0.00
30.0 DEGREE AMPLITUDE	6.44	3.80	2.16	3.24	1.45	0.00
60.0 DEGREE AMPLITUDE	3.03	4.69	2.52	3.57	1.48	0.00
90.0 DEGREE AMPLITUDE	-1.19	4.33	2.20	2.95	1.11	0.00
120.0 DEGREE AMPLITUDE	-5.09	2.81	1.29	1.54	.44	0.00
150.0 DEGREE AMPLITUDE	-7.63	.53	.03	-.28	-.33	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	2.0386	1.0343	7.7819
30.0 DEGREE DISPLACEMENT	3.2435	1.4534	5.8362
60.0 DEGREE DISPLACEMENT	3.5793	1.4831	2.3267
90.0 DEGREE DISPLACEMENT	2.9560	1.1154	-1.8062
120.0 DEGREE DISPLACEMENT	1.5406	.4488	-5.4551
150.0 DEGREE DISPLACEMENT	-.2875	-.3380	-7.6424

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET ,

WAVE PERIOD 11.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 0.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.20	6.37	0.00	2.22	0.00	0.00
0.0 DEGREE AMPLITUDE	-5.49	-4.65	0.00	-1.31	0.00	0.00
30.0 DEGREE AMPLITUDE	-1.70	-6.20	0.00	-.23	0.00	0.00
60.0 DEGREE AMPLITUDE	2.53	-6.09	0.00	.90	0.00	0.00
90.0 DEGREE AMPLITUDE	6.09	-4.35	0.00	1.79	0.00	0.00
120.0 DEGREE AMPLITUDE	8.02	-1.44	0.00	2.21	0.00	0.00
150.0 DEGREE AMPLITUDE	7.80	1.85	0.00	2.03	0.00	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-1.3144	0.0000	-4.1949
30.0 DEGREE DISPLACEMENT	-.2389	0.0000	.0237
60.0 DEGREE DISPLACEMENT	.9006	0.0000	4.2359
90.0 DEGREE DISPLACEMENT	1.7988	0.0000	7.3131
120.0 DEGREE DISPLACEMENT	2.2150	0.0000	8.4308
150.0 DEGREE DISPLACEMENT	2.0378	0.0000	7.2894

ENGINEERING DEPARTMENT
COMPUTATION SHEET
McD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO CASE 11
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

D = 40.0 (46,000 DWT TANKER LOADED)

WD = 150.0
DISPL = 1,350.7 M_1 = 84.3 M_2 = 84.3 M_3 = 1.0

Tw = 11.0 H = 10.0

E = 0.0 X = -16.0 Y = 0.0 A = 459.0
T_{S1} = 9.8 T_{S2} = 9.7 T_{S3} = 10.8 T_{S4} = 16.1 T_{S5} = 21.7 T_{S6} = 1.0

E = 10.0 X = 0.0 Y = -16.0 A = 269.25
T_{S1} = 9.8 T_{S2} = 9.3 T_{S3} = 8.2 T_{S4} = 14.5 T_{S5} = 9.1 T_{S6} = 1.0

E = 20.0 X = 0.0 Y = -16.0 A = 179.5
T_{S1} = 9.8 T_{S2} = 8.6 T_{S3} = 6.95 T_{S4} = 11.9 T_{S5} = 5.0 T_{S6} = 1.0

E = 30.0 X = 0.0 Y = -16.0 A = 89.75
T_{S1} = 9.8 T_{S2} = 7.7 T_{S3} = 7.3 T_{S4} = 8.85 T_{S5} = 6.05 T_{S6} = 1.0

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET.

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 11.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 10.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.20	6.03	.92	3.03	.98	0.00
0.0 DEGREE AMPLITUDE	-3.53	5.18	.66	-1.83	.80	0.00
30.0 DEGREE AMPLITUDE	-6.76	2.94	.25	-2.79	.40	0.00
60.0 DEGREE AMPLITUDE	-8.18	-.08	-.22	-3.00	-.10	0.00
90.0 DEGREE AMPLITUDE	-7.40	-3.09	-.64	-2.41	-.57	0.00
120.0 DEGREE AMPLITUDE	-4.65	-5.27	-.89	-1.17	-.90	0.00
150.0 DEGREE AMPLITUDE	-.64	-6.03	-.89	.38	-.98	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-1.8336	.8004	-3.7185
30.0 DEGREE DISPLACEMENT	-2.7944	.4042	-6.8347
60.0 DEGREE DISPLACEMENT	-3.0064	-.1002	-8.1196
90.0 DEGREE DISPLACEMENT	-2.4129	-.5778	-7.2289
120.0 DEGREE DISPLACEMENT	-1.1728	-.9006	-4.4011
150.0 DEGREE DISPLACEMENT	.3815	-.9820	-.3941

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 11.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 20.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.21	5.27	1.53	5.43	1.05	0.00
0.0 DEGREE AMPLITUDE	4.16	5.06	1.53	-.92	1.05	0.00
30.0 DEGREE AMPLITUDE	.07	5.11	1.35	-3.47	.86	0.00
60.0 DEGREE AMPLITUDE	-4.04	3.78	.82	-5.10	.44	0.00
90.0 DEGREE AMPLITUDE	-7.07	1.44	.06	-5.35	-.09	0.00
120.0 DEGREE AMPLITUDE	-8.21	-1.28	-.71	-4.17	-.60	0.00
150.0 DEGREE AMPLITUDE	-7.14	-3.66	-1.29	-1.87	-.95	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-.9249	1.0500	3.7396
30.0 DEGREE DISPLACEMENT	-3.4794	.8608	-.3080
60.0 DEGREE DISPLACEMENT	-5.1016	.4409	-4.2731
90.0 DEGREE DISPLACEMENT	-5.3568	-.0970	-7.0933
120.0 DEGREE DISPLACEMENT	-4.1767	-.6090	-8.0128
150.0 DEGREE DISPLACEMENT	-1.8774	-.9578	-6.7853

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEE

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 11.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 30.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.21	4.27	2.35	4.70	1.72	0.00
0.0 DEGREE AMPLITUDE	8.16	2.13	1.27	1.65	1.11	0.00
30.0 DEGREE AMPLITUDE	6.58	3.70	2.09	3.53	1.62	0.00
60.0 DEGREE AMPLITUDE	3.24	4.27	2.34	4.64	1.70	0.00
90.0 DEGREE AMPLITUDE	-.96	3.70	1.97	4.40	1.32	0.00
120.0 DEGREE AMPLITUDE	-4.91	2.14	1.07	2.99	.59	0.00
150.0 DEGREE AMPLITUDE	-7.54	0.00	-.11	.77	-.30	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	1.6535	1.1117	7.8050
30.0 DEGREE DISPLACEMENT	3.6357	1.6251	6.0023
60.0 DEGREE DISPLACEMENT	4.6437	1.7030	2.5913
90.0 DEGREE DISPLACEMENT	4.4073	1.3246	-1.5139
120.0 DEGREE DISPLACEMENT	2.9901	.5913	-5.2136
150.0 DEGREE DISPLACEMENT	.7716	-.3004	-7.5163

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET WITH 22,500 DWT

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 7.100 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.07	7.39	.92	3.64	.45	0.00
0.0 DEGREE AMPLITUDE	-.29	-6.84	-.86	-1.68	-.21	0.00
30.0 DEGREE AMPLITUDE	-4.29	-7.32	-.92	-3.07	-.38	0.00
60.0 DEGREE AMPLITUDE	-7.13	-5.83	-.73	-3.64	-.45	0.00
90.0 DEGREE AMPLITUDE	-8.06	-2.77	-.34	-3.23	-.40	0.00
120.0 DEGREE AMPLITUDE	-6.83	1.01	.12	-1.95	-.24	0.00
150.0 DEGREE AMPLITUDE	-3.77	4.54	.57	-.15	-.01	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-1.6880	-.2102	-.2978
30.0 DEGREE DISPLACEMENT	-3.0795	-.3835	-4.2904
60.0 DEGREE DISPLACEMENT	-3.6457	-.4541	-7.1334
90.0 DEGREE DISPLACEMENT	-3.2351	-.4029	-8.0650
120.0 DEGREE DISPLACEMENT	-1.9577	-.2438	-6.8356
150.0 DEGREE DISPLACEMENT	-.1556	-.0193	-3.7745

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 7.100 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.01	7.83	.98	2.36	.29	0.00
0.0 DEGREE AMPLITUDE	-.04	7.82	.98	-.72	-.09	0.00
30.0 DEGREE AMPLITUDE	-4.04	6.60	.83	-1.75	-.21	0.00
60.0 DEGREE AMPLITUDE	-6.96	3.61	.45	-2.31	-.28	0.00
90.0 DEGREE AMPLITUDE	-8.01	-.34	-.04	-2.25	-.28	0.00
120.0 DEGREE AMPLITUDE	-6.91	-4.21	-.52	-1.58	-.19	0.00
150.0 DEGREE AMPLITUDE	-3.96	-6.95	-.87	-.49	-.06	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-.7237	-.0901	-.0481
30.0 DEGREE DISPLACEMENT	-1.7522	-.2182	-4.0490
60.0 DEGREE DISPLACEMENT	-2.3112	-.2878	-6.9650
90.0 DEGREE DISPLACEMENT	-2.2509	-.2803	-8.0146
120.0 DEGREE DISPLACEMENT	-1.5875	-.1977	-6.9168
150.0 DEGREE DISPLACEMENT	-.4987	-.0621	-3.9656

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET WITH 22,500 LWT

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 10.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.07	7.33	1.24	3.52	.52	0.00
0.0 DEGREE AMPLITUDE	-.14	-6.74	-1.09	-1.52	-.18	0.00
30.0 DEGREE AMPLITUDE	-4.16	-7.28	-1.24	-2.91	-.40	0.00
60.0 DEGREE AMPLITUDE	-7.06	-5.86	-1.06	-3.51	-.51	0.00
90.0 DEGREE AMPLITUDE	-8.06	-2.88	-.59	-3.17	-.48	0.00
120.0 DEGREE AMPLITUDE	-6.91	.87	.02	-1.98	-.32	0.00
150.0 DEGREE AMPLITUDE	-3.90	4.39	.64	-.26	-.08	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-1.5275	-.1865	-.1490
30.0 DEGREE DISPLACEMENT	-2.9122	-.4046	-4.1640
60.0 DEGREE DISPLACEMENT	-3.5165	-.5143	-7.0632
90.0 DEGREE DISPLACEMENT	-3.1785	-.4862	-8.0697
120.0 DEGREE DISPLACEMENT	-1.9889	-.3277	-6.9140
150.0 DEGREE DISPLACEMENT	-.2663	-.0815	-3.9057

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION. BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET WITH 23 Sec Dmt

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 10.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.01	7.77	1.39	2.34	.35	0.00
0.0 DEGREE AMPLITUDE	.09	7.77	1.39	-.67	-.08	0.00
30.0 DEGREE AMPLITUDE	-3.92	6.63	1.23	-1.70	-.24	0.00
60.0 DEGREE AMPLITUDE	-6.89	3.71	.75	-2.28	-.34	0.00
90.0 DEGREE AMPLITUDE	-8.01	-.19	.06	-2.24	-.34	0.00
120.0 DEGREE AMPLITUDE	-6.99	-4.05	-.64	-1.60	-.25	0.00
150.0 DEGREE AMPLITUDE	-4.09	-6.83	-1.17	-.53	-.09	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	-.6769	-.0895	.0996
30.0 DEGREE DISPLACEMENT	-1.7097	-.2483	-3.9210
60.0 DEGREE DISPLACEMENT	-2.2843	-.3406	-6.8911
90.0 DEGREE DISPLACEMENT	-2.2469	-.3415	-8.0148
120.0 DEGREE DISPLACEMENT	-1.6074	-.2510	-6.9908
150.0 DEGREE DISPLACEMENT	-.5372	-.0932	-4.0937

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 13.750 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.04	3.92	.81	3.45	.65	0.00
0.0 DEGREE AMPLITUDE	3.23	3.87	.81	3.45	.65	0.00
30.0 DEGREE AMPLITUDE	-.87	3.66	.72	3.02	.54	0.00
60.0 DEGREE AMPLITUDE	-4.75	2.47	.43	1.77	.28	0.00
90.0 DEGREE AMPLITUDE	-7.36	.61	.03	.05	-.04	0.00
120.0 DEGREE AMPLITUDE	-7.99	-1.40	-.38	-1.67	-.36	0.00
150.0 DEGREE AMPLITUDE	-6.48	-3.04	-.69	-2.96	-.58	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	3.4549	.6532	3.2397
30.0 DEGREE DISPLACEMENT	3.0211	.5432	-.8771
60.0 DEGREE DISPLACEMENT	1.7778	.2877	-4.7589
90.0 DEGREE DISPLACEMENT	.0581	-.0449	-7.3656
120.0 DEGREE DISPLACEMENT	-1.6771	-.3655	-7.9987
150.0 DEGREE DISPLACEMENT	-2.9630	-.5881	-6.4885

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 13.750 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.09	3.64	.79	4.35	.69	0.00
0.0 DEGREE AMPLITUDE	3.43	3.62	.79	4.29	.69	0.00
30.0 DEGREE AMPLITUDE	-.69	3.31	.69	4.06	.58	0.00
60.0 DEGREE AMPLITUDE	-4.62	2.11	.40	2.74	.31	0.00
90.0 DEGREE AMPLITUDE	-7.32	.35	.01	.68	-.03	0.00
120.0 DEGREE AMPLITUDE	-8.06	-1.50	-.38	-1.55	-.37	0.00
150.0 DEGREE AMPLITUDE	-6.63	-2.96	-.67	-3.37	-.62	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	4.2986	.6947	3.4323
30.0 DEGREE DISPLACEMENT	4.0661	.5832	-.6907
60.0 DEGREE DISPLACEMENT	2.7440	.3154	-4.6286
90.0 DEGREE DISPLACEMENT	.6867	-.0368	-7.3264
120.0 DEGREE DISPLACEMENT	-1.5545	-.3792	-8.0610
150.0 DEGREE DISPLACEMENT	-3.3793	-.6200	-6.6356

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET

WATER DEPTH AT BUOY 60.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 16.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.04	3.98	1.06	3.63	.88	0.00
0.0 DEGREE AMPLITUDE	3.36	3.91	1.05	3.63	.88	0.00
30.0 DEGREE AMPLITUDE	-.73	3.78	.98	3.26	.75	0.00
60.0 DEGREE AMPLITUDE	-4.64	2.63	.65	2.01	.43	0.00
90.0 DEGREE AMPLITUDE	-7.30	.79	.14	.23	0.00	0.00
120.0 DEGREE AMPLITUDE	-8.01	-1.27	-.40	-1.61	-.44	0.00
150.0 DEGREE AMPLITUDE	-6.56	-2.99	-.84	-3.02	-.76	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	3.6305	.8820	3.3658
30.0 DEGREE DISPLACEMENT	3.2614	.7597	-.7398
60.0 DEGREE DISPLACEMENT	2.0185	.4339	-4.6472
90.0 DEGREE DISPLACEMENT	.2347	-.0081	-7.3095
120.0 DEGREE DISPLACEMENT	-1.6119	-.4480	-8.0131
150.0 DEGREE DISPLACEMENT	-3.0267	-.7679	-6.5696

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, BUOY WITH SOLID SKIRT WITH DIAMETER OF 40.000 FEET WITH 70.000 CM

WATER DEPTH AT BUOY 150.000 FEET

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 16.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
MAXIMUM AMPLITUDE	8.09	3.65	.99	4.52	1.01	0.00
0.0 DEGREE AMPLITUDE	3.55	3.62	.98	4.41	1.01	0.00
30.0 DEGREE AMPLITUDE	-.55	3.36	.89	4.30	.90	0.00
60.0 DEGREE AMPLITUDE	-4.51	2.20	.56	3.04	.55	0.00
90.0 DEGREE AMPLITUDE	-7.26	.44	.08	.96	.05	0.00
120.0 DEGREE AMPLITUDE	-8.07	-1.42	-.42	-1.37	-.46	0.00
150.0 DEGREE AMPLITUDE	-6.71	-2.91	-.81	-3.34	-.84	0.00

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	4.4190	1.0108	3.5577
30.0 DEGREE DISPLACEMENT	4.3089	.9014	-.5523
60.0 DEGREE DISPLACEMENT	3.0443	.5505	-4.5144
90.0 DEGREE DISPLACEMENT	.9640	.0520	-7.2669
120.0 DEGREE DISPLACEMENT	-1.3746	-.4603	-8.0722
150.0 DEGREE DISPLACEMENT	-3.3449	-.8493	-6.7145

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, SHIP WITH DEAD WEIGHT TONNAGE OF 22.500, LENGTH OF 579.2

DRAFT CONDITION, BALLAST

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 10.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-
MAXIMUM AMPLITUDE	.86	2.92	2.69	1.51	.22
0.0 DEGREE AMPLITUDE	.83	2.86	-1.85	1.09	.21
30.0 DEGREE AMPLITUDE	.83	2.19	-.62	1.47	.22
60.0 DEGREE AMPLITUDE	.61	.92	.76	1.45	.17
90.0 DEGREE AMPLITUDE	.22	-.58	1.95	1.05	.07
120.0 DEGREE AMPLITUDE	-.22	-1.93	2.62	.36	-.04
150.0 DEGREE AMPLITUDE	-.61	-2.77	2.58	-.41	-.14

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	1.0623	-.0243	10.0444
30.0 DEGREE DISPLACEMENT	1.4724	.2158	8.2216
60.0 DEGREE DISPLACEMENT	1.4881	.3982	4.1957
90.0 DEGREE DISPLACEMENT	1.1049	.4738	-.9543
120.0 DEGREE DISPLACEMENT	.4257	.4225	-5.8486
150.0 DEGREE DISPLACEMENT	-.3674	.2579	-9.1759

INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

EAD WEIGHT TONNAGE OF 22.500, LENGTH OF 579.200 FEET AND BEAM OF 77.000 FEET

WAVE HEIGHT 10.000 FEET

VE T-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
86	2.92	2.69	1.51	.22	.13
93	2.86	-1.85	1.09	.21	.06
83	2.19	-.62	1.47	.22	0.00
61	.92	.76	1.45	.17	-.06
22	-.58	1.95	1.05	.07	-.11
22	-1.93	2.62	.36	-.04	-.13
61	-2.77	2.58	-.41	-.14	-.11

LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
1.0623	-.0243	10.0444
1.4724	.2158	8.2216
1.4881	.3982	4.1957
1.1049	.4738	-.9543
.4257	.4225	-5.8486
-.3674	.2579	-9.1759

2

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, SHIP WITH DEAD WEIGHT TONNAGE OF 22.500, LENGTH OF 579.20

DRAFT CONDITION, LOADED

WAVE PERIOD 10.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 7.100 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-
MAXIMUM AMPLITUDE	.99	3.05	2.13	1.51	.14
0.0 DEGREE AMPLITUDE	.87	-2.83	2.13	1.08	.13
30.0 DEGREE AMPLITUDE	.99	-1.88	1.83	1.46	.13
60.0 DEGREE AMPLITUDE	.85	-.43	1.05	1.45	.10
90.0 DEGREE AMPLITUDE	.48	1.13	-.01	1.05	.04
120.0 DEGREE AMPLITUDE	-.01	2.39	-1.07	.36	-.02
150.0 DEGREE AMPLITUDE	-.51	3.02	-1.85	-.41	-.09

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	1.0663	-.0338	-8.0890
30.0 DEGREE DISPLACEMENT	1.4658	.1320	-4.7871
60.0 DEGREE DISPLACEMENT	1.4726	.2625	-.2026
90.0 DEGREE DISPLACEMENT	1.0847	.3226	4.4362
120.0 DEGREE DISPLACEMENT	.4062	.2963	7.8863
150.0 DEGREE DISPLACEMENT	-.3810	.1905	9.2234

NC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

WEIGHT TONNAGE OF 22.500, LENGTH OF 579.200 FEET AND BEAM OF 77.000 FEET

E HEIGHT 10.000 FEET

PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
3.05	2.13	1.51	.14	.09
-2.83	2.13	1.08	.13	.04
-1.88	1.83	1.46	.13	0.00
-.43	1.05	1.45	.10	-.04
1.13	-.01	1.05	.04	-.07
2.39	-1.07	.36	-.02	-.09
3.02	-1.85	-.41	-.09	-.08

ONGITUDINAL ISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
1.0663	-.0338	-8.0890
1.4658	.1320	-4.7871
1.4726	.2625	-.2026
1.0847	.3226	4.4362
.4062	.2963	7.8863
-.3810	.1905	9.2234

2

J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, SHIP WITH DEAD WEIGHT TONNAGE OF 70.000, LENGTH OF 839.10

DRAFT CONDITION, LOADED

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 13.750 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-
MAXIMUM AMPLITUDE	1.11	2.16	2.95	3.10	.47
0.0 DEGREE AMPLITUDE	.98	-2.00	-2.89	2.73	.47
30.0 DEGREE AMPLITUDE	1.11	-1.33	-2.22	3.10	.42
60.0 DEGREE AMPLITUDE	.95	-.30	-.94	2.63	.25
90.0 DEGREE AMPLITUDE	.53	.80	.57	1.46	.02
120.0 DEGREE AMPLITUDE	-.02	1.69	1.95	-.09	-.21
150.0 DEGREE AMPLITUDE	-.58	2.13	2.80	-1.63	-.39

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	2.6698	.2415	-8.9104
30.0 DEGREE DISPLACEMENT	3.1014	.4137	-5.7599
60.0 DEGREE DISPLACEMENT	2.7019	.4750	-1.0660
90.0 DEGREE DISPLACEMENT	1.5785	.4090	3.9134
120.0 DEGREE DISPLACEMENT	.0321	.2334	7.8443
150.0 DEGREE DISPLACEMENT	-1.5228	-.0046	9.6733

INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

AD WEIGHT TONNAGE OF 70.000, LENGTH OF 839.100 FEET AND BEAM OF 115.000 FEET

AVE HEIGHT 10.000 FEET

E	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
1	2.16	2.95	3.10	.47	.12
8	-2.00	-2.89	2.73	.47	.06
1	-1.33	-2.22	3.10	.42	0.00
5	-.30	-.94	2.63	.25	-.06
3	.80	.57	1.46	.02	-.11
2	1.69	1.95	-.09	-.21	-.12
8	2.13	2.80	-1.63	-.39	-.11

LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
2.6698	.2415	-8.9104
3.1014	.4137	-5.7599
2.7019	.4750	-1.0660
1.5785	.4090	3.9134
.0321	.2334	7.8443
-1.5228	-.0046	9.6733

2

AD-A034 246 MCDERMOTT (J RAY) CO INC NEW ORLEANS LA F/G 13/10
ENGINEERING DESIGN CALCULATIONS MONO-MOORING SYSTEM. VOLUME 5. --ETC(U)
1966 DA-44-009-AMC-841(T)

UNCLASSIFIED NL

3 OF 3
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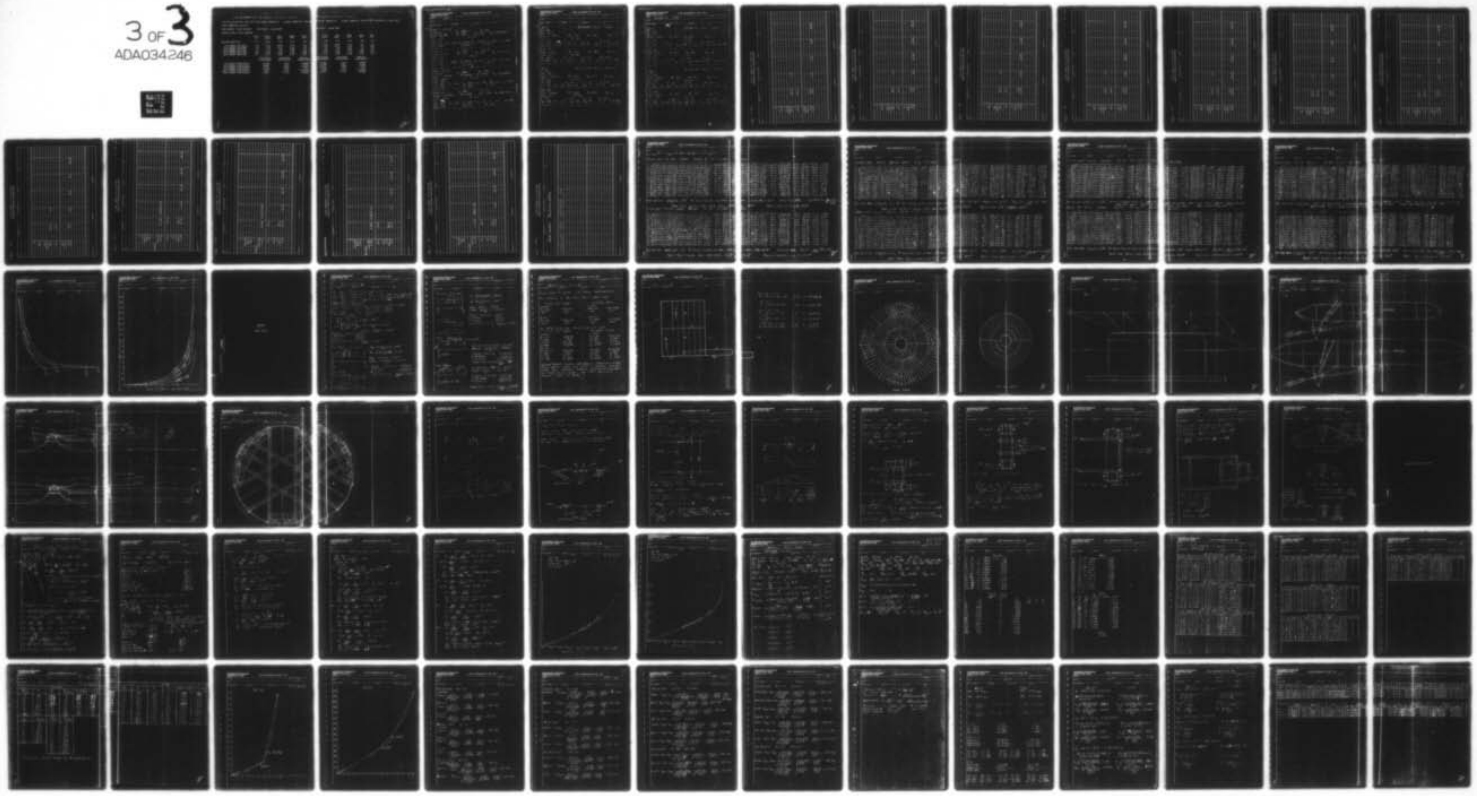

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J. RAY MC DERMOTT CO., INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

TYPE OF CALCULATION, SHIP WITH DEAD WEIGHT TONNAGE OF 70.000, LENGTH OF 839.100

DRAFT CONDITION, BALLAST

WAVE PERIOD 12.000 SECONDS WAVE HEIGHT 10.000 FEET

HEADING ANGLE 16.000 DEGREES

	HEAVE -FT-	PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-
MAXIMUM AMPLITUDE	1.01	2.08	3.43	3.14	.63
0.0 DEGREE AMPLITUDE	.98	2.04	-3.21	2.76	.63
30.0 DEGREE AMPLITUDE	.98	1.57	-2.17	3.14	.56
60.0 DEGREE AMPLITUDE	.72	.67	-.55	2.67	.34
90.0 DEGREE AMPLITUDE	.26	-.40	1.21	1.48	.03
120.0 DEGREE AMPLITUDE	-.26	-1.36	2.65	-.09	-.29
150.0 DEGREE AMPLITUDE	-.71	-1.97	3.39	-1.65	-.53

	LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
0.0 DEGREE DISPLACEMENT	2.6916	.3642	4.9253
30.0 DEGREE DISPLACEMENT	3.1389	.5581	4.3028
60.0 DEGREE DISPLACEMENT	2.7451	.6023	2.5273
90.0 DEGREE DISPLACEMENT	1.6158	.4852	.0747
120.0 DEGREE DISPLACEMENT	.0535	.2381	-2.3979
150.0 DEGREE DISPLACEMENT	-1.5231	-.0728	-4.2280

INC. ENGINEERS AND GENERAL CONTRACTORS NEW ORLEANS, LA.

D WEIGHT TONNAGE OF 70.000, LENGTH OF 839.100 FEET AND BEAM OF 115.000 FEET

VE HEIGHT 10.000 FEET

PITCH -DEG-	ROLL -DEG-	SURGE -FT-	SWAY -FT-	YAW -DEG-
2.08	3.43	3.14	.63	.15
2.04	-3.21	2.76	.63	.07
1.57	-2.17	3.14	.56	0.00
.67	-.55	2.67	.34	-.07
-.40	1.21	1.48	.03	-.12
-1.36	2.65	-.09	-.29	-.15
-1.97	3.39	-1.65	-.53	-.13

LONGITUDINAL DISPLACEMENT	TRANSVERSE DISPLACEMENT	VERTICAL DISPLACEMENT
2.6916	.3642	4.9253
3.1389	.5581	4.3028
2.7451	.6023	2.5273
1.6158	.4852	.0747
.0535	.2381	-2.3979
-1.5231	-.0728	-4.2280

2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY 3395 | SHEET NO

SUBJECT

DRAWING NUMBER | COMPUTER | CHECKED BY | DATE

9

DWT 22,500
LOADED L. 570.2 B. 77.0
DISPL. 70,099 M_1 = 8,325 M_2 3,126 M_3 = 107,849,965
Tw. 10.0 H = 10.0
E = 7.1°
T_{S1} 8.20 T_{S2} = 10.00 T_{S3} = 10.20 T_{S4} = 14.14 T_{S5} = 14.14 T_{S6} = 14.14
X = 200.00 Y = 25.0 A = 0.00

10

BALLAST L. 579.2 B. 77.0
DISPL. 35,049 M_1 = 1,170 M_2 1,375 M_3 = 52,937,083
Tw = 10.0 H = 10.0
E = 10.0°
T_{S1} 7.00 T_{S2} 10.40 T_{S3} 9.30 T_{S4} 14.14 T_{S5} 14.14 T_{S6} 14.14
X 200.00 Y 25.00 A 0.00

11

DWT 70,000
LOADED L = 830.1 B. 115.0
DISPL. 209,985 M_1 = 6,819 M_2 8,903 M_3 = 639,019,271
Tw 12.00 H 10.0
E = 13.75°
T_{S1} = 9.80 T_{S2} 12.00 T_{S3} 12.00 T_{S4} 14.14 T_{S5} = 14.14 T_{S6} 16.97
X = 200.0 Y = 570 A = 0.0

12

BALLAST L. 839.1 B. 115.0
DISPL. 102,493 M_1 = 3,430 M_2 3,950 M_3 318,278,210
Tw = 12.0 H 10.0
E = 18.[redacted]°
T_{S1} = 8.4 T_{S2} 12.5 T_{S3} 11.8 T_{S4} 14.14 T_{S5} 14.14 T_{S6} 16.97
X = 200.0 Y = 57.0 A 0.0

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY	SHEET NO
SUBJECT	
DRAWING NUMBER	COMPUTER / CHECKED BY / DATE

5 BUOY (70,000 DWT TANKER LOADED)

D = 40.0
W.D = 60.0
DISPL = 1,347.9 M_1 = 83.7 M_2 = 83.7 M_3 = 1.0
Tw = 12.0 H = 10.0
E = 13.75 X = 0.0 Y = 0.0 A = 200.0
T_{S1} = 9.65 T_{S2} = 8.2 T_{S3} = 6.8 T_{S4} = 6.8 T_{S5} = 3.8 T_{S6} = 16.97

6 W.D = 150
DISPL = 1,350.7 M_1 = 84.3 M_2 = 84.3 M_3 = 1.0
Tw = 12.0 H = 10.0
E = 13.75 X = 0.0 Y = 0.0 A = 200.0
T_{S1} = 9.80 T_{S2} = 7.6 T_{S3} = 6.5 T_{S4} = 8.5 T_{S5} = 4.8 T_{S6} = 16.97

7 BUOY (70,000 DWT TANKER BALLAST)

D = 40.0
W.D = 60.0
DISPL = 1,341.4 M_1 = 83.7 M_2 = 83.7 M_3 = 1.0
Tw = 12.0 H = 10.0
E = 16.0 X = 0.0 Y = 0.0 A = 200.0
T_{S1} = 9.65 T_{S2} = 8.1 T_{S3} = 7.8 T_{S4} = 7.3 T_{S5} = 5.8 T_{S6} = 16.97

8 W.D = 150
DISPL = 1,350.7 M_1 = 84.3 M_2 = 84.3 M_3 = 1.0
Tw = 12.0 H = 10.0
E = 16.0 X = 0.0 Y = 0.0 A = 200.0
T_{S1} = 9.80 T_{S2} = 7.7 T_{S3} = 7.2 T_{S4} = 8.8 T_{S5} = 7.1 T_{S6} = 16.97

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 8015

J. RAY McDERMOTT & CO., INC.

COMPANY	SHEET NO
COMPUTER INPUT	

SUBJECT

DRAWING NUMBER	COMPUTER	CHECKED BY	DATE
	[redacted]		

1

BUOY (22,500 DWT TANKER LOADED)
D = 40.0
W.D. 60.0
DISPL = 1,347.4 M_1 = 83.7 M_2 = 83.7 M_3 = 1.0
T_W = 10.0 H = 10.0
E = 7.1 X = 0.0 Y = 0.0 A = 200.0
T_{S1} = 9.65 T_{S2} = 10.40 T_{S3} = 10.40 T_{S4} = 12.50 T_{S5} = 12.50 T_{S6} = 14.14

2

W.D = 150.0
DISPL = 1,350.7 M_1 84.3 M_2 84.3 M_3 1.0
T_W = 10.0 H = 10.0
E = 7.1 X 0.0 Y 0.0 A 200.0
T_{S1} = 9.80 T_{S2} 9.2 T_{S3} 9.2 T_{S4} = 14.30 T_{S5} 14.30 T_{S6} = 14.14

3

BUOY (22,500 DWT TANKER BALLAST)
D = 40.0.
W.D. 60.0
DISPL 1,347.4 M_1 = 83.7 M_2 83.7 M_3 1.0
TW 10.0 H = 10.0
E 10.0 X 0.0 Y = 0.0 A 200.0
T_{S1} = 9.65 T_{S2} 10.40 T_{S3} = 10.70 T_{S4} 12.60 T_{S5} 13.30 T_{S6} 14.14

4

WD 150.0
DISPL 1,350.7 M_1 84.3 M_2 84.3 M_3 1.0
TW 10.0 H = 10.0
E = 10.0 X = 0.0 Y 0.0 A 200.0
T_{S1} = 9.80 T_{S2} 9.20 T_{S3} 9.40 T_{S4} 14.30 T_{S5} 15.10 T_{S6} 14.14

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MCD 12504

J. RAY McDERMOTT & CO., INC.

COMPUTER PROGRAM DOCUMENTATION

DATE	PROGRAM NO.	USER GROUP NUMBER	PAGE	OF

TITLE

5

2						
1						
40.0						
1						
60.0						
1347.4						
83.7	83.7	1.0				
1						
120.0	10.0					
1						
13.75						
200.0						
0.0	0.0					
9.65	8.2	6.8	6.8	3.8	16.97	

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McD 12504

J. RAY McDERMOTT & CO., INC.

COMPUTER PROGRAM DOCUMENTATION

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TITLE

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

2							
1							
40.0							
1							
150.0							
1350.7							
84.3	84.3	1.10					
1							
10.0	10.0						
1							
7.1							
200.0							
0.0	0.0						
9.80	9.2	9.2	14.30	14.30	14.14		

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MCD 12504

J. RAY McDERMOTT & CO., INC.

COMPUTER PROGRAM DOCUMENTATION

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TITLE

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

2						
1						
401.0						
1						
60.0						
1347.4						
83.7	83.7	1.10				
1						
10.0	10.0					

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

71.1						
2001.0						
0.0	0.0					
9.65	10.40	10.40	12.50	12.50	14.14	

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

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J. RAY McDERMOTT & CO., INC.

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TITLE

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

2						
1						
40.0						
1						
150.0						
1350.7						
84.3	84.3	1.0				
1						
10.0	10.0					
1						
10.0						
200.0						
0.0	0.0					
9.80	9.20	9.40	14.30	15.10	14.14	

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J. RAY McDERMOTT & CO., INC.

COMPUTER PROGRAM DOCUMENTATION

DATE	PROGRAM NO.	USER GROUP NUMBER	PAGE	OF

TITLE

3

1–12	13–24	25–36	37–48	49–60	61–72	73–80
2						
1						
40.0						
1						
60.0						
1347.4						
83.7	83.7	1.0				
1						
10.0	10.0					
1						
10.0						
2001.0						
0.0	0.0					
9.65	10.40	10.70	12.60	13.30	14.14	

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INPUT DESCRIPTION

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J. RAY McDERMOTT & CO., INC.

COMPUTER PROGRAM DOCUMENTATION

DATE	PROGRAM NO.	USER GROUP NUMBER	PAGE	OF

TITLE

6

```
2
1
40.0
1
150.0
1350.7
84.3      84.3      1.10
1
12.0      10.0
1
13.75
200.0
0.0       0.0
9.80      7.6       6.5       8.5       4.8       16.97
```

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INPUT FORMATION

MCD 12504

J. RAY MCDERMOTT & CO., INC.

COMPUTER PROGRAM DOCUMENTATION

DATE	PROGRAM NO.	USER GROUP NUMBER	PAGE	OF

TITLE

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

7

```
2
1
40.0
1
60.0
1347.4
83.7                83.7                1.0
1
12.0                10.0
1
16.0
200.0
0.0                 0.0
9.165               8.9                 7.8                 7.3                 5.8                 16.97
```

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

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MCD 12504

J. RAY McDERMOTT & CO., INC.

COMPUTER PROGRAM DOCUMENTATION

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TITLE

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

2						
1						
90.0						
1						
150.0						
13501.7						
84.3	84.3	1.0				
1						
12.0	10.0					
1						
16.0						
200.0						
01.0	0.0					
9.80	7.7	7.2	8.8	7.1	16.97	

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

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INPUT CARDS

McD 12504

J. RAY McDERMOTT & CO., INC.

COMPUTER PROGRAM DOCUMENTATION

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TITLE

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

```
1
1
22.500
579.2
77.0
1
LOADED
70.099
2.325    31.126    1078449.965
1
```

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

```
101.0    110.0
1
71.5
0.100
2001.0    125.0
8.120    10.00    10.210    14.14    14.14    14.14
```

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

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McD 12504

J. RAY McDERMOTT & CO., INC.

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DATE	PROGRAM NO.	USER GROUP NUMBER	PAGE	OF

TITLE

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

```
1
1
70.000
839.1
115.0
1
LORDED
204.985
6.814    81.903    6390 19.271
1
```

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

```
121.0    10.0
1
13.175
01.0
200.0    57.0
9.80     12.00    12.00    14.14    14.14    16.197
```

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

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INPUT SPECIFICATIONS
McD 12504

J. RAY McDERMOTT & CO., INC.
COMPUTER PROGRAM DOCUMENTATION

DATE	PROGRAM NO.	USER GROUP NUMBER	PAGE	OF

TITLE

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

12

```
1
1
70.000
839.1
115.0
1
BALLAST
102.493
3.430          31.950          3182178.210
1
```

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

```
121.0          10.0
1
161.0
01.0
200.0          57.0
81.4           12.5           11.8           14.14          14.14          16.97
```

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

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MCD 12504

J. RAY McDERMOTT & CO., INC.

COMPUTER PROGRAM DOCUMENTATION

DATE	PROGRAM NO.	USER GROUP NUMBER	PAGE	OF

TITLE

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
```

```
1
1
22.500
579.2
77.0
1
BALLAST
35.049
1.170                1.375          529137.089
1
```

```
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
```

```
10.0                 10.0
1
10.0
01.0
200.0                25.00
7.100                10.40          9.310          14.14          14.14          14.14
```

```
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
```

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INPUT SPECIFICATIONS
MCD 12504

J. RAY MCDERMOTT & CO., INC.
COMPUTER PROGRAM DOCUMENTATION

DATE	PROGRAM NO	USER GROUP NUMBER	PAGE	OF

TITLE JOB-60511 PROJECT-3440

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

1.0	61.0	1567.0	01.0	0.03018	10.1	
0.03018	01.03018	150.0	300.0	300.0	2	

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

SUBMITTED BY	PUNCHED BY	VERIFIED BY

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY | SHEET NO

SUBJECT: RELATIVE MOTION OF MOORED BUOY & SHIP

DRAWING NUMBER | COMPUTER | CHECKED BY | DATE

22,500 DWT TANKER LOADED 60' WD X = 7.1° TW = 10SEC

0°	$\sqrt{(100+1.69+1.07)^2+(55+0.21-0.03)^2+(5+0.30-8.09)^2}$	− 114.24 =	$\sqrt{102.7}$ + 55
30°	$\sqrt{(100+3.08+1.47)^2+(55+0.38+0.13)^2+(5+4.29-9.79)^2}$	− 114.24 =	$\sqrt{104.5}$ + 55
60°	$\sqrt{(100+3.65+1.47)^2+(55+0.45+0.26)^2+(5+7.13-0.20)^2}$	− 114.24 =	$\sqrt{105.1}$ + 55
90°	$\sqrt{(100+3.24+1.08)^2+(55+0.40+0.32)^2+(5+8.07+9.44)^2}$	− 114.24 =	$\sqrt{104.3}$ + 55
120°	$\sqrt{(100+1.96+0.41)^2+(55+0.24+0.30)^2+(5+6.84+7.80)^2}$	− 114.24 =	$\sqrt{102.9}$ + 55
150°	$\sqrt{(100+0.16-0.38)^2+(55+0.02+0.19)^2+(5+3.77+9.22)^2}$	− 114.24 =	$\sqrt{99.70}$ + 55
180°	$\sqrt{(100-1.69-1.07)^2+(55-0.21-0.03)^2+(5-0.30+8.09)^2}$	− 114.24 =	$\sqrt{97.29}$ + 54
210°	$\sqrt{(100-3.08-1.47)^2+(55-0.38-0.13)^2+(5-4.29+9.79)^2}$	− 114.24 =	$\sqrt{95.45}$ + 54
240°	$\sqrt{(100-3.65-1.47)^2+(55-0.45-0.26)^2+(5-7.13+0.20)^2}$	− 114.24 =	$\sqrt{94.88}$ + 54
270°	$\sqrt{(100-3.24-1.08)^2+(55-0.40-0.32)^2+(5-8.07-9.44)^2}$	− 114.24 =	$\sqrt{95.68}$ + 54
300°	$\sqrt{(100-1.96-0.41)^2+(55-0.24-0.30)^2+(5-6.84-7.80)^2}$	− 114.24 =	$\sqrt{97.63}$ + 54
330°	$\sqrt{(100-0.16+0.38)^2+(55-0.02-0.19)^2+(5-3.77-9.22)^2}$	− 114.24 =	$\sqrt{100.23}$ + 54

MAX FREE AMPL. $\frac{5.33+4.91}{2}$ = 5.12' MAX BUOY EXCITING FORCE FOR 1' AMPL = 6.62

WAVE FORCE MOORING LOAD = 2.05 × 33.01 = 67

22,500 DWT TANKER LOADED 150' WD X = 7.1° TW = 10SEC

0°	$\sqrt{(100+0.72+1.07)^2+(55+0.09-0.03)^2+(5+0.05-8.09)^2}$	− 114.24 =	$\sqrt{101.70}$ + 55
30°	$\sqrt{(100+1.75+1.47)^2+(55+0.22+0.13)^2+(5+4.05-9.79)^2}$	− 114.24 =	$\sqrt{103.27}$ + 55
60°	$\sqrt{(100+2.31+1.47)^2+(55+0.29+0.26)^2+(5+6.97-0.20)^2}$	− 114.24 =	$\sqrt{103.78}$ + 55
90°	$\sqrt{(100+2.25+1.08)^2+(55+0.28+0.32)^2+(5+8.01+9.44)^2}$	− 114.24 =	$\sqrt{103.33}$ + 55
120°	$\sqrt{(100+1.59+0.41)^2+(55+0.20+0.30)^2+(5+6.92+7.80)^2}$	− 114.24 =	$\sqrt{102.00}$ + 55
150°	$\sqrt{(100+0.50-0.38)^2+(55+0.06+0.19)^2+(5+3.97+9.22)^2}$	− 114.24 =	$\sqrt{100.12}$ + 55
180°	$\sqrt{(100-0.72-1.07)^2+(55-0.09+0.03)^2+(5-0.05+8.09)^2}$	− 114.24 =	$\sqrt{98.21}$ + 54
210°	$\sqrt{(100-1.75-1.47)^2+(55-0.22-0.13)^2+(5-4.05+9.79)^2}$	− 114.24 =	$\sqrt{96.70}$ + 54
240°	$\sqrt{(100-2.31-1.47)^2+(55+0.29-0.26)^2+(5-6.97+0.20)^2}$	− 114.24 =	$\sqrt{96.22}$ + 54
270°	$\sqrt{(100-2.25-1.08)^2+(55-0.28-0.32)^2+(5-8.01-9.44)^2}$	− 114.24 =	$\sqrt{96.62}$ + 54
300°	$\sqrt{(100-1.59-0.41)^2+(55+0.20-0.30)^2+(5-6.92-7.80)^2}$	− 114.24 =	$\sqrt{98.06}$ + 54
330°	$\sqrt{(100-0.50+0.38)^2+(55-0.06-0.19)^2+(5-3.97-9.22)^2}$	− 114.24 =	$\sqrt{99.86}$ + 54

MAX FREE AMPL. $\frac{4.39+3.65}{2}$ = 4.02 MAX BUOY EXCITING FORCE FOR 1' AMPL = 13.29 × 4

WAVE FORCE MOORING LOAD 1.59 × 33.48 = 53.23

10 SEC

$\sqrt{102.2^2 + 55.11^2 + (-3.06)^2} - 114.24 = \sqrt{13,613.81} - 114.24 = 116.68 - 114.24 = +2.44$

$\sqrt{104.5^2 + 55.51^2 + 4.50^2} - 114.24 = \sqrt{14,032.31} - 114.24 = 118.46 - 114.24 = +4.22$

$\sqrt{105.1^2 + 55.71^2 + 11.93^2} - 114.24 = \sqrt{14,296.14} - 114.24 = 119.57 - 114.24 = +5.33$

$\sqrt{104.3^2 + 55.72^2 + 12.51^2} - 114.24 = \sqrt{14,293.98} - 114.24 = 119.56 - 114.24 = +5.32$

$\sqrt{102.3^2 + 55.54^2 + 10.73^2} - 114.24 = \sqrt{13,953.58} - 114.24 = 118.13 - 114.24 = +3.89$

$\sqrt{99.70^2 + 55.21^2 + 12.99^2} - 114.24 = \sqrt{13,327.83} - 114.24 = 115.45 - 114.24 = +1.21$

$\sqrt{97.24^2 + 54.82^2 + 12.79^2} - 114.24 = \sqrt{12,624.43} - 114.24 = 112.36 - 114.24 = -1.88$

$\sqrt{95.45^2 + 54.49^2 + 5.50^2} - 114.24 = \sqrt{12,110.11} - 114.24 = 110.05 - 114.24 = -4.19$

$\sqrt{94.88^2 + 54.29^2 + 1.93^2} - 114.24 = \sqrt{11,953.34} - 114.24 = 109.33 - 114.24 = -4.91$

$\sqrt{95.68^2 + 54.28^2 + (-7.51)^2} - 114.24 = \sqrt{12,157.38} - 114.24 = 110.26 - 114.24 = -3.98$

$\sqrt{97.63^2 + 54.46^2 + (-10.72)^2} - 114.24 = \sqrt{12,615.64} - 114.24 = 112.32 - 114.24 = -1.92$

$\sqrt{100.2^2 + 54.79^2 + (-7.99)^2} - 114.24 = \sqrt{13,109.83} - 114.24 = 114.50 - 114.24 = +0.26$

AMPL $= 0.621 \times 1 \times 83.7 = 33.01^K$ MOORING LINE 22 K/FT BUOY AMPLITUDE $\frac{22}{53.01} \times 5.12 = 2.05'$

01 $= 67.67^K$ MOORING LINE $= (5.12 - 2.05) \times 22 = 67.54^K$

10 SEC

$\sqrt{101.7^2 + 55.06^2 + (-3.04)^2} - 114.24 = \sqrt{13,402.05} - 114.24 = 115.77 - 114.24 = +1.53$

$\sqrt{103.27^2 + 55.35^2 + 4.26^2} - 114.24 = \sqrt{13,736.14} - 114.24 = 117.20 - 114.24 = +2.96$

$\sqrt{104.28^2 + 55.55^2 + 11.77^2} - 114.24 = \sqrt{13,994.62} - 114.24 = 118.30 - 114.24 = +4.06$

$\sqrt{103.33^2 + 55.60^2 + 12.45^2} - 114.24 = \sqrt{14,072.95} - 114.24 = 118.63 - 114.24 = +4.39$

$\sqrt{102.00^2 + 55.50^2 + 10.81^2} - 114.24 = \sqrt{13,876.39} - 114.24 = 117.80 - 114.24 = +3.56$

$\sqrt{100.12^2 + 55.25^2 + 10.19^2} - 114.24 = \sqrt{13,907.45} - 114.24 = 115.79 - 114.24 = +1.55$

$\sqrt{98.21^2 + 54.91^2 + 13.04^2} - 114.24 = \sqrt{12,833.65} - 114.24 = 113.29 - 114.24 = -0.95$

$\sqrt{96.71^2 + 54.65^2 + 5.77^2} - 114.24 = \sqrt{12,385.94} - 114.24 = 111.29 - 114.24 = -2.95$

$\sqrt{96.21^2 + 54.45^2 + (-1.77)^2} - 114.24 = \sqrt{12,226.22} - 114.24 = 110.57 - 114.24 = -3.65$

$\sqrt{96.61^2 + 54.40^2 + (-7.95)^2} - 114.24 = \sqrt{12,359.95} - 114.24 = 111.18 - 114.24 = -3.06$

$\sqrt{98.06^2 + 54.50^2 + (-9.81)^2} - 114.24 = \sqrt{12,570.49} - 114.24 = 112.56 - 114.24 = -1.68$

$\sqrt{99.86^2 + 54.75^2 + (-8.19)^2} - 114.24 = \sqrt{13,040.65} - 114.24 = 114.20 - 114.24 = -0.04$

$= 1.3994 \times 1 \times 84.3 = 33.48^K$ MOORING LINE 22 K/FT BUOY AMPL $= \frac{22}{55.48} \times 4.02 = 1.59'$

53.23^K MOORING LINE $(4.02 - 1.59) \times 22 = 53.24^K$

2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

22,500 DWT TANKER BALLAST 60'WD X=10° TW 10SEC

0° $\sqrt{(100+1.53+1.06)^2+(55+0.19-0.02)^2+(32+0.15+10.04)^2}$ − 118.56 = $\sqrt{102.5^2+55.17^2}$

30° $\sqrt{(100+2.91+1.47)^2+(55+0.40+0.22)^2+(32+2.16+8.22)^2}$ − 118.56 = $\sqrt{104.36^2+55.62^2}$

60° $\sqrt{(100+3.52+1.47)^2+(55+0.51+0.40)^2+(32+7.06+4.20)^2}$ − 118.56 = $\sqrt{105.01^2+55.71^2}$

90° $\sqrt{(100+3.18+1.10)^2+(55+0.43+0.47)^2+(32+8.07-0.95)^2}$ − 118.56 = $\sqrt{104.28^2+55.96^2}$

120° $\sqrt{(100+1.99+0.43)^2+(55+0.33+0.42)^2+(32+6.21-5.85)^2}$ − 118.56 = $\sqrt{102.42^2+55.75^2}$

150° $\sqrt{(100+0.27-0.37)^2+(55+0.08+0.26)^2+(32+3.91-9.18)^2}$ − 118.56 = $\sqrt{99.90^2+55.34^2}$

180° $\sqrt{(100-1.53-1.06)^2+(55-0.19+0.02)^2+(32-0.15-10.04)^2}$ − 118.56 = $\sqrt{97.41^2+54.84^2}$

210° $\sqrt{(100-2.91-1.47)^2+(55-0.40-0.22)^2+(32-4.16-8.22)^2}$ − 118.56 = $\sqrt{95.62^2+54.38^2}$

240° $\sqrt{(100-3.52-1.47)^2+(55-0.51-0.40)^2+(32-7.06-4.20)^2}$ − 118.56 = $\sqrt{94.99^2+54.09^2}$

270° $\sqrt{(100-3.18-1.10)^2+(55-0.43-0.47)^2+(32-8.07+0.95)^2}$ − 118.56 = $\sqrt{95.32^2+54.04^2}$

300° $\sqrt{(100-1.99-0.43)^2+(55-0.33-0.42)^2+(32-6.21+5.85)^2}$ − 118.56 = $\sqrt{97.58^2+54.25^2}$

330° $\sqrt{(100-0.27+0.37)^2+(55-0.08-0.26)^2+(32-3.91+9.18)^2}$ − 118.56 = $\sqrt{100.10^2+54.66^2}$

MAX FREE AMPL. $\frac{8.03+7.30}{2}$ = 7.66' MAX BUOY EXCITING FORCE FOR 1' = 0.999×1×95

WAVE FORCE MOORING LOAD = 2.89×33.01 95.40K

22,500 DWT TANKER BALLAST 150'WD X = 10° TW 10SEC

0° $\sqrt{(100+0.68+1.06)^2+(55+0.09-0.02)^2+(32-0.10+10.04)^2}$ − 118.56 = $\sqrt{101.71^2+55.07^2}$

30° $\sqrt{(100+1.21+1.47)^2+(55+0.25+0.22)^2+(32+3.92+8.22)^2}$ − 118.56 = $\sqrt{103.18^2+55.47^2}$

60° $\sqrt{(100+2.28+1.47)^2+(55+0.34+0.40)^2+(32+6.80+4.20)^2}$ − 118.56 = $\sqrt{103.77^2+55.74^2}$

90° $\sqrt{(100+2.25+1.10)^2+(55+0.34+0.47)^2+(32+8.01-0.95)^2}$ − 118.56 = $\sqrt{103.55^2+55.81^2}$

120° $\sqrt{(100+1.61+0.43)^2+(55+0.25+0.42)^2+(32+6.99-5.85)^2}$ − 118.56 = $\sqrt{102.04^2+55.67^2}$

150° $\sqrt{(100+0.54-0.37)^2+(55+0.09+0.26)^2+(32+4.02-9.18)^2}$ − 118.56 = $\sqrt{100.17^2+55.35^2}$

180° $\sqrt{(100-0.68-1.06)^2+(55-0.09+0.02)^2+(32+0.10-10.04)^2}$ − 118.56 = $\sqrt{98.26^2+54.93^2}$

210° $\sqrt{(100-1.21-1.47)^2+(55-0.25-0.22)^2+(32-3.92-8.22)^2}$ − 118.56 = $\sqrt{96.82^2+54.53^2}$

240° $\sqrt{(100-2.28-1.47)^2+(55-0.34-0.40)^2+(32-6.80-4.20)^2}$ − 118.56 = $\sqrt{96.23^2+54.26^2}$

270° $\sqrt{(100-2.25-1.10)^2+(55-0.34-0.47)^2+(32-8.01+0.95)^2}$ − 118.56 = $\sqrt{96.65^2+54.19^2}$

300° $\sqrt{(100-1.61-0.43)^2+(55-0.25-0.42)^2+(32-6.99+5.85)^2}$ − 118.56 = $\sqrt{97.96^2+54.33^2}$

330° $\sqrt{(100-0.54+0.37)^2+(55-0.09-0.26)^2+(32-4.09+9.18)^2}$ − 118.56 = $\sqrt{99.83^2+54.65^2}$

MAX FREE AMPL. $\frac{6.87+6.13}{2}$ = 6.50' MAX BUOY EXCITING FORCE FOR 1' AMPL = 0.9×89.3

WAVE FORCE MOORING LOAD = 2.44×33.2 81.13

40SEC

102.5'	$+55.17^2+42.19^2$	−118.56	$\sqrt{15,348.43}$	118.56	123.89 − 118.56	+5.33
104.38'	$+55.62^2+44.38^2$	−118.56	$\sqrt{15,955.55}$	118.56	126.33 − 118.56	+7.77
105.01'	$55.91^2+43.26^2$	−118.56	$\sqrt{16,029.46}$	118.56	126.59 − 118.56	+8.03
104.28'	$55.96^2+39.12^2$	−118.56	$\sqrt{15,536.21}$	118.56	124.64 − 118.56	+6.08
102.42'	$55.75^2+33.06^2$	−118.56	$\sqrt{14,690.88}$	118.56	121.21 − 118.56	+2.65
99.90'	$55.39^2+26.73^2$	−118.56	$\sqrt{13,757.02}$	118.56	117.29 − 118.56	−1.27
97.41'	$54.84^2+21.81^2$	−118.56	$\sqrt{12,971.81}$	118.56	113.89 − 118.56	−4.67
95.62'	$54.38^2+19.62^2$	−118.56	$\sqrt{12,485.31}$	118.56	111.74 − 118.56	−6.82
94.99'	$54.09^2+20.74^2$	−118.56	$\sqrt{12,378.98}$	118.56	111.26 − 118.56	−7.30
95.82'	$54.04^2+24.88^2$	−118.56	$\sqrt{12,701.65}$	118.56	112.70 − 118.56	−5.86
97.58'	$54.25^2+30.94^2$	−118.56	$\sqrt{13,422.20}$	118.56	115.85 − 118.56	−2.71
100.10'	$54.66^2+37.27^2$	−118.56	$\sqrt{14,396.78}$	118.56	119.99 − 118.56	+1.43

71' = 0.994 × 1 × 83.7 = 33.31^K Mooring Line = 20^K/Ft Buoy Ampl. = $\frac{20}{53.01}$ × 7.66 = 2.89'

33.31 95.40^K Mooring Line = (7.66 − 2.89) × 20 = 95.40^K

Sec

101.74'	$55.07^2+41.94^2$	−118.56	$\sqrt{15,142.70}$	118.56	123.06 − 118.56	+4.50
103.18'	$55.47^2+44.14^2$	−118.56	$\sqrt{15,671.37}$	118.56	125.19 − 118.56	+6.63
103.77'	$55.74^2+43.09^2$	−118.56	$\sqrt{15,731.91}$	118.56	125.43 − 118.56	+6.87
103.95'	$55.81^2+39.06^2$	−118.56	$\sqrt{15,321.66}$	118.56	123.78 − 118.56	+5.22
102.04'	$55.67^2+33.14^2$	−118.56	$\sqrt{14,609.57}$	118.56	120.87 − 118.56	+2.31
100.17'	$55.35^2+26.91^2$	−118.56	$\sqrt{13,821.80}$	118.56	117.57 − 118.56	−0.99
98.26'	$54.93^2+22.06^2$	−118.56	$\sqrt{13,158.38}$	118.56	114.71 − 118.56	−3.85
96.82'	$54.53^2+19.86^2$	−118.56	$\sqrt{12,742.05}$	118.56	112.88 − 118.56	−5.68
96.23'	$54.26^2+20.91^2$	−118.56	$\sqrt{12,641.59}$	118.56	112.43 − 118.56	−6.13
96.65'	$54.19^2+24.94^2$	−118.56	$\sqrt{12,899.78}$	118.56	113.58 − 118.56	−4.98
97.96'	$54.33^2+30.86^2$	−118.56	$\sqrt{13,500.25}$	118.56	116.19 − 118.56	−2.37
99.83'	$54.65^2+37.09^2$	−118.56	$\sqrt{14,328.32}$	118.56	119.70 − 118.56	+1.14

= 0.994 × 83.3 = 33.25^K Mooring Line = 20^K/Ft Buoy Ampl = $\frac{20}{53.25}$ × 6.50 = 2.44'

× 33.2 = 81.13^K Mooring Line = (6.50 − 2.44) × 20 = 81.20^K

2.

ENGINEERING DEPARTMENT
COMPUTATION SHEET

J. RAY McDERMOTT & CO., INC.

MCD 14003

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

70,000 DWT TANKER LOADED 60' W.D X = 13.75° TW =

0°	$\sqrt{(90-3.45+2.67)^2+(52-0.65+0.24)^2+(14-3.24-8.91)^2}$	$-104.88 =$	$\sqrt{89.22^2+5[illegible]^2+1.8[illegible]}$
30°	$\sqrt{(90-3.02+3.10)^2+(52-0.54+0.41)^2+(14+0.88-5.76)^2}$	$-104.88 =$	$\sqrt{90.08^2+51.[illegible]^2+3.12}$
60°	$\sqrt{(90-1.78+2.70)^2+(52-0.29+0.47)^2+(14+4.76-1.07)^2}$	$-104.88 =$	$\sqrt{91.92^2+52.1^2+17.6[illegible]}$
90°	$\sqrt{(90-0.06+1.58)^2+(52+0.01+0.41)^2+(14+7.37+3.91)^2}$	$-104.88 =$	$\sqrt{91.52^2+52.[illegible]^2+25.28}$
120°	$\sqrt{(90+1.68+0.03)^2+(52+0.37+0.23)^2+(14+8.00+7.84)^2}$	$-104.88 =$	$\sqrt{91.71^2+52.[illegible]^2+29.84}$
150°	$\sqrt{(90+2.96-1.52)^2+(52+0.59-0.00)^2+(14+6.49+9.67)^2}$	$-104.88 =$	$\sqrt{91.44^2+52.5^2+30.16}$
180°	$\sqrt{(90+3.45-2.67)^2+(52+0.65-0.24)^2+(14+3.24+8.91)^2}$	$-104.88 =$	$\sqrt{90.78^2+52.[illegible]^2+26.15}$
210°	$\sqrt{(90+3.02-3.10)^2+(52+0.54-0.41)^2+(14-0.88+5.76)^2}$	$-104.88 =$	$\sqrt{89.9[illegible]^2+52.1[illegible]^2+18.88}$
240°	$\sqrt{(90+1.78-2.70)^2+(52+0.29-0.47)^2+(14-4.76+1.07)^2}$	$-104.88 =$	$\sqrt{89.08^2+51.8[illegible]^2+10.31}$
270°	$\sqrt{(90+0.06-1.58)^2+(52-0.01-0.41)^2+(14-7.37-3.91)^2}$	$-104.88 =$	$\sqrt{88.48^2+51.5[illegible]^2+2.72}$
300°	$\sqrt{(90-1.68-0.03)^2+(52-0.37-0.23)^2+(14-8.00-7.84)^2}$	$-104.88 =$	$\sqrt{88.29^2+51.4[illegible]^2+(-1.84}$
330°	$\sqrt{(90-2.96+1.52)^2+(52-0.59+0.00)^2+(14-6.49-9.67)^2}$	$-104.88 =$	$\sqrt{88.56^2+51.41^2+(-2.16)}$

MAX FREE AMPL. $\frac{1.98+2.70}{2} = 3.84'$ MAX EXCITING FORCE FOR 1' AMPL OF BODY = $\frac{(6.28}{12}$ [illegible] $\times 83.7$

WAVE FORCE MOORING LOAD = [illegible] $.18 \times 22.$

70,000 DWT TANKER LOADED 150' WD X = 13.75° TW = 12[illegible]

0°	$\sqrt{(90-4.30+2.67)^2+(52-0.69+0.24)^2+(14-3.43-8.91)^2}$	$-104.88 =$	$\sqrt{88.37^2+51.5[illegible]^2+1.6[illegible]}$
30°	$\sqrt{(90-4.07+3.10)^2+(52-0.58+0.41)^2+(14+0.69-5.76)^2}$	$-104.88 =$	$\sqrt{89.03^2+51.[illegible]^2+8.[illegible]}$
60°	$\sqrt{(90-2.74+2.70)^2+(52-0.32+0.47)^2+(14+4.63-1.07)^2}$	$-104.88 =$	$\sqrt{89.96^2+52.1[illegible]^2+17.5[illegible]}$
90°	$\sqrt{(90-0.62+1.58)^2+(52+0.01+0.41)^2+(14+7.33+3.91)^2}$	$-104.88 =$	$\sqrt{90.89^2+52.4[illegible]^2+25.2[illegible]}$
120°	$\sqrt{(90+1.55+0.03)^2+(52+0.38+0.23)^2+(14+8.06+7.84)^2}$	$-104.88 =$	$\sqrt{91.58^2+52.6[illegible]^2+29.9[illegible]}$
150°	$\sqrt{(90+3.38-1.52)^2+(52+0.62-0.00)^2+(14+6.64+9.67)^2}$	$-104.88 =$	$\sqrt{91.86^2+52.6[illegible]^2+30.3[illegible]}$
180°	$\sqrt{(90+4.30-2.67)^2+(52+0.69-0.24)^2+(14+3.43+8.91)^2}$	$-104.88 =$	$\sqrt{91.63^2+52.4[illegible]^2+26.3[illegible]}$
210°	$\sqrt{(90+4.07-3.10)^2+(52+0.58-0.41)^2+(14-0.69+5.76)^2}$	$-104.88 =$	$\sqrt{90.97^2+52.1[illegible]^2+19.0[illegible]}$
240°	$\sqrt{(90+2.74-2.70)^2+(52+0.32-0.47)^2+(14-4.63+1.07)^2}$	$-104.88 =$	$\sqrt{90.04^2+51.8[illegible]^2+10.4[illegible]}$
270°	$\sqrt{(90+0.62-1.58)^2+(52-0.04-0.41)^2+(14-7.33-3.91)^2}$	$-104.88 =$	$\sqrt{89.11^2+51.5[illegible]^2+2.7[illegible]}$
300°	$\sqrt{(90-1.55-0.03)^2+(52-0.38-0.23)^2+(14-8.06-7.84)^2}$	$-104.88 =$	$\sqrt{88.42^2+51.3[illegible]^2+(-1.9[illegible]}$
330°	$\sqrt{(90-3.38+1.52)^2+(52-0.62+0.00)^2+(14-6.64-9.67)^2}$	$-104.88 =$	$\sqrt{88.14^2+51.36^2+(-2.31}$

MAX FREE AMPL. $\frac{5.03+2.83}{2} = 3.96'$ MAX EXCITING FORCE FOR 1' BODY AMPL = 0.27[illegible] $\times 84.3 =$ [illegible]

WAVE FORCE MOORING LOAD = 3.27[illegible] $3.03 =$ [illegible]

Tw = 12SEC

5[illegible]^2 + 1.85^2 − 104.88	= √10,625.16 − 104.88	= 103.08 − 104.88	= −1.80
5[illegible]^2 + 9.12^2 − 104.88	= √10,888.08 − 104.88	= 104.35 − 104.88	= −0.53
2.1^2 + 17.69^2 − 104.88	= √11,332.12 − 104.88	= 106.31 − 104.88	= +1.43
2.4^2 + 25.28^2 − 104.88	= √11,765.99 − 104.88	= 108.97 − 104.88	= +3.59
2.6^2 + 29.84^2 − 104.88	= √12,067.91 − 104.88	= 109.86 − 104.88	= +4.98
2.5^2 + 30.16^2 − 104.88	= √12,036.61 − 104.88	= 109.71 − 104.88	= +4.83
2.4^2 + 26.15^2 − 104.88	= √11,671.69 − 104.88	= 108.04 − 104.88	= +3.16
2.1^2 + 18.88^2 − 104.88	= √11,159.60 − 104.88	= 105.64 − 104.88	= +0.76
1.8^2 + 10.31^2 − 104.88	= √10,726.85 − 104.88	= 103.57 − 104.88	= −1.31
1.5^2 + 2.72^2 − 104.88	= √10,493.51 − 104.88	= 102.44 − 104.88	= −2.44
1.4^2 + (−1.84)^2 − 104.88	= √10,490.47 − 104.88	= 102.18 − 104.88	= −2.70
1.41^2 + (−2.16)^2 − 104.88	= √10,490.53 − 104.88	= 102.42 − 104.88	= −2.46

16.28 × 83.7 = 27.93^k Mooring Line 110.0^k/Ft Body Ampl = $\frac{110.0}{132.05}$ × 3.84 = 3.18'

17 × 27.93 = 72.92^k Mooring Line 3.84 − 3.18 = 0.66' × 110.0 = 72.6^k 132.93

W = 12 SEC

1.53^2 + 1.66^2 − 104.88	= √10,469.42 − 104.88	= 102.32 − 104.88	= −2.56
1.8^2 + 8.93^2 − 104.88	= √10,692.43 − 104.88	= 103.40 − 104.88	= −1.48
2.1^2 + 17.56^2 − 104.88	= √11,120.78 − 104.88	= 105.46 − 104.88	= +0.58
2.4^2 + 25.24^2 − 104.88	= √11,640.05 − 104.88	= 107.93 − 104.88	= +3.05
2.6^2 + 29.90^2 − 104.88	= √12,048.72 − 104.88	= 109.77 − 104.88	= +4.89
2.6^2 + 30.31^2 − 104.88	= √12,092.78 − 104.88	= 109.97 − 104.88	= +5.09
2.4^2 + 26.34^2 − 104.88	= √11,840.86 − 104.88	= 108.82 − 104.88	= +3.94
2.1^2 + 19.07^2 − 104.88	= √11,360.91 − 104.88	= 106.59 − 104.88	= +1.71
1.8^2 + 10.49^2 − 104.88	= √10,904.62 − 104.88	= 104.43 − 104.88	= −0.45
1.5^2 + 2.76^2 − 104.88	= √10,605.61 − 104.88	= 102.98 − 104.88	= −1.90
1.32^2 + (−1.90)^2 − 104.88	= √10,462.64 − 104.88	= 102.23 − 104.88	= −2.59
1.38^2 + (−2.31)^2 − 104.88	= √10,413.90 − 104.88	= 102.05 − 104.88	= −2.83

.27 × 84.3 = 23.09^k Mooring Line 110.0 ^{k}/Ft Body Ampl = $\frac{110.0}{132.05}$ × 3.96 = 3.27'

27 × 23.09 = 75.56^k Mooring Line: (3.96 − 3.27) × 110.0 = 75.90^k

2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003,

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

70,000 DWT TANKER BALLAST 60' WD X = 15° TW = 12 SEC

0° $\sqrt{(90-3.63+2.62)^2+(52-0.88+0.36)^2+(43-3.37+4.93)^2}$ − 112.49 = $\sqrt{89.06^2}$ 51.48² +

30° $\sqrt{(90-3.26+3.14)^2+(52-0.76+0.56)^2+(43+0.74+4.30)^2}$ − 112.49 = $\sqrt{89.88^2}$ 51.80² +

60° $\sqrt{(90-2.02+2.75)^2+(52-0.43+0.60)^2+(43+4.65+2.53)^2}$ − 112.49 = $\sqrt{90.73^2}$ 52.17² +

90° $\sqrt{(90-0.23+1.62)^2+(52+0.01+0.48)^2+(43+7.31+0.07)^2}$ − 112.49 = $\sqrt{91.39^2}$ 52.49² +

120° $\sqrt{(90+1.61+0.05)^2+(52+0.45+0.24)^2+(43+8.01-2.40)^2}$ − 112.49 = $\sqrt{91.66^2}$ 52.69² +

150° $\sqrt{(90+3.03-1.52)^2+(52+0.77-0.07)^2+(43+6.57-4.23)^2}$ − 112.49 = $\sqrt{91.51^2}$ 52.70² +

180° $\sqrt{(90+3.63-2.69)^2+(52+0.88-0.36)^2+(43+3.37-4.93)^2}$ − 112.49 = $\sqrt{90.94^2}$ 52.52² +

210° $\sqrt{(90+3.26-3.14)^2+(52+0.76-0.56)^2+(43-0.74-4.30)^2}$ − 112.49 = $\sqrt{90.12^2}$ 52.20² +

240° $\sqrt{(90+2.02-2.75)^2+(52+0.43-0.60)^2+(43-4.65-2.53)^2}$ − 112.49 = $\sqrt{89.27^2}$ 51.83² +

270° $\sqrt{(90+0.23-1.62)^2+(52-0.01-0.48)^2+(43-7.31-0.07)^2}$ − 112.49 = $\sqrt{88.61^2}$ 51.51² +

300° $\sqrt{(90-1.61-0.05)^2+(52-0.45-0.24)^2+(43-8.01+2.40)^2}$ − 112.49 = $\sqrt{88.34^2}$ 51.31² +

330° $\sqrt{(90-3.03+1.52)^2+(52-0.77+0.07)^2+(43-6.57+4.23)^2}$ − 112.49 = $\sqrt{88.49^2}$ 51.30² +

MAX FREE AMPL. $\frac{4.32+3.98^2}{2}$ = 4.15' MAX EXCITING FORCE FOR 1' BUOY AMPL. 0.2739×83

WAVE FORCE MOORING LOAD 3.18 × 22.3 = 72.9

70,000 DWT TANKER BALLAST 150' WD X = 15° TW = 12 SEC

0° $\sqrt{(90-4.42+2.69)^2+(52-1.01+0.36)^2+(43-3.56+4.93)^2}$ − 112.49 = $\sqrt{88.27^2}$ 51.35² +

30° $\sqrt{(90-4.31+3.14)^2+(52-0.90+0.56)^2+(43+0.55+4.30)^2}$ − 112.49 = $\sqrt{88.83^2}$ 51.66² +

60° $\sqrt{(90-3.04+2.75)^2+(52-0.55+0.60)^2+(43+4.51+2.53)^2}$ − 112.49 = $\sqrt{89.71^2}$ 52.05² +

90° $\sqrt{(90-0.96+1.62)^2+(52-0.05+0.48)^2+(43+7.27+0.07)^2}$ − 112.49 = $\sqrt{90.66^2}$ 52.49² +

120° $\sqrt{(90+1.37+0.05)^2+(52+0.46+0.24)^2+(43+8.07-2.40)^2}$ − 112.49 = $\sqrt{91.42^2}$ 52.70² +

150° $\sqrt{(90+3.34-1.52)^2+(52+0.85-0.07)^2+(43+6.71-4.23)^2}$ − 112.49 = $\sqrt{91.82^2}$ 52.78² +

180° $\sqrt{(90+4.42-2.69)^2+(52+1.01-0.36)^2+(43+3.56-4.93)^2}$ − 112.49 = $\sqrt{91.73^2}$ 52.65² +

210° $\sqrt{(90+4.31-3.14)^2+(52+0.90-0.56)^2+(43-0.55-4.30)^2}$ − 112.49 = $\sqrt{91.17^2}$ 52.34² +

240° $\sqrt{(90+3.04-2.75)^2+(52+0.55-0.60)^2+(43-4.51-2.53)^2}$ − 112.49 = $\sqrt{90.29^2}$ 51.95² +

270° $\sqrt{(90+0.96-1.62)^2+(52+0.05-0.48)^2+(43-7.27-0.07)^2}$ − 112.49 = $\sqrt{89.34^2}$ 51.57² +

300° $\sqrt{(90-1.37-0.05)^2+(52-0.46-0.24)^2+(43-8.07+2.40)^2}$ − 112.49 = $\sqrt{88.58^2}$ 51.30² +

331° $\sqrt{(90-3.34+1.52)^2+(52-0.85+0.07)^2+(43-6.71+4.23)^2}$ − 112.49 = $\sqrt{88.18^2}$ 51.22² +

MAX FREE AMPL. $\frac{3.72+3.53}{2}$ = 3.63' MAX EXCITING FORCE FOR 1' BUOY AMPL. = 0.2739 × 84.3

WAVE FORCE MOORING LOAD = 2.78 × 23.0 = 64.19

Tw = 12 SEC

89.06²	51.48² + 44.56²	− 112.49 =	√12,567.48	− 112.49 =	112.10 − 112.49 = −0.39
89.88²	51.80² + 48.09²	− 112.49 =	√13,069.50	− 112.49 =	114.32 − 112.49 = +1.83
90.73²	52.17² + 50.18²	− 112.49 =	√13,471.67	− 112.49 =	116.61 − 112.49 = +4.12
91.33²	52.49² + 50.38²	− 112.49 =	√13,645.48	− 112.49 =	116.81 − 112.49 = +4.32
91.66²	52.69² + 48.61²	− 112.49 =	√13,540.72	− 112.49 =	116.36 − 112.49 = +3.87
91.51²	52.70² − 45.39²	− 112.49 =	√13,207.09	− 112.49 =	114.92 − 112.49 = +2.43
90.94²	52.52² + 41.44²	− 112.49 =	√12,745.71	− 112.49 =	112.90 − 112.49 = +0.41
90.12²	52.20² + 37.96²	− 112.49 =	√12,287.42	− 112.49 =	110.85 − 112.49 = −1.64
89.27²	51.83² + 35.82²	− 112.49 =	√11,934.55	− 112.49 =	109.26 − 112.49 = −3.23
88.61²	51.51² + 35.62²	− 112.49 =	√11,773.80	− 112.49 =	108.51 − 112.49 = −3.98
88.34²	51.31² + 37.39²	− 112.49 =	√11,634.68	− 112.49 =	108.79 − 112.49 = −3.70
88.99²	51.30² + 40.66²	− 112.49 =	√12,115.41	− 112.49 =	110.07 − 112.49 = −2.42

Buoy Ampl 0.2739 × 83.7 = 22.93″ Mooring Line 75#/ft Buoy Ampl $\frac{75}{2293}$ × 4.15 = 3.18′

18 × 22.93 = 72.92 K Mooring Line (4.15 + 3.18) × 75 = 72.75 K

7 SEC

88.21²	51.35² + 44.37²	− 112.49 =	√12,397.11	− 112.49 =	111.34 − 112.49 = −1.15
88.83²	51.66² + 47.85²	− 112.49 =	√12,849.15	− 112.49 =	113.35 − 112.49 = +0.86
89.71²	52.05² + 50.04²	− 112.49 =	√13,261.09	− 112.49 =	115.16 − 112.49 = +2.67
90.66²	52.49² + 50.34²	− 112.49 =	√13,502.76	− 112.49 =	116.20 − 112.49 = +3.71
91.42²	52.70² + 48.67²	− 112.49 =	√13,503.68	− 112.49 =	116.21 − 112.49 = +3.72
91.82²	52.78² + 45.98²	− 112.49 =	√13,285.07	− 112.49 =	115.26 − 112.49 = +2.77
91.73²	52.65² + 41.63²	− 112.49 =	√12,910.47	− 112.49 =	113.66 − 112.49 = +1.17
91.17²	52.34² + 38.15²	− 112.49 =	√12,506.87	− 112.49 =	111.83 − 112.49 = −0.66
90.29²	51.95² + 35.96²	− 112.49 =	√12,144.21	− 112.49 =	110.20 − 112.49 = −2.29
89.34²	51.57² + 35.66²	− 112.49 =	√11,912.79	− 112.49 =	109.15 − 112.49 = −3.34
88.58²	51.30² + 37.33²	− 112.49 =	√11,871.64	− 112.49 =	108.96 − 112.49 = −3.53
88.18²	51.22² + 40.52²	− 112.49 =	√12,041.07	− 112.49 =	109.73 − 112.49 = −2.76

Ampl − 0.2739 × 84.3 = 23.09″ Mooring Line 75#/ft Buoy Ampl $\frac{75}{9809}$ × 3.63 = 2.78′

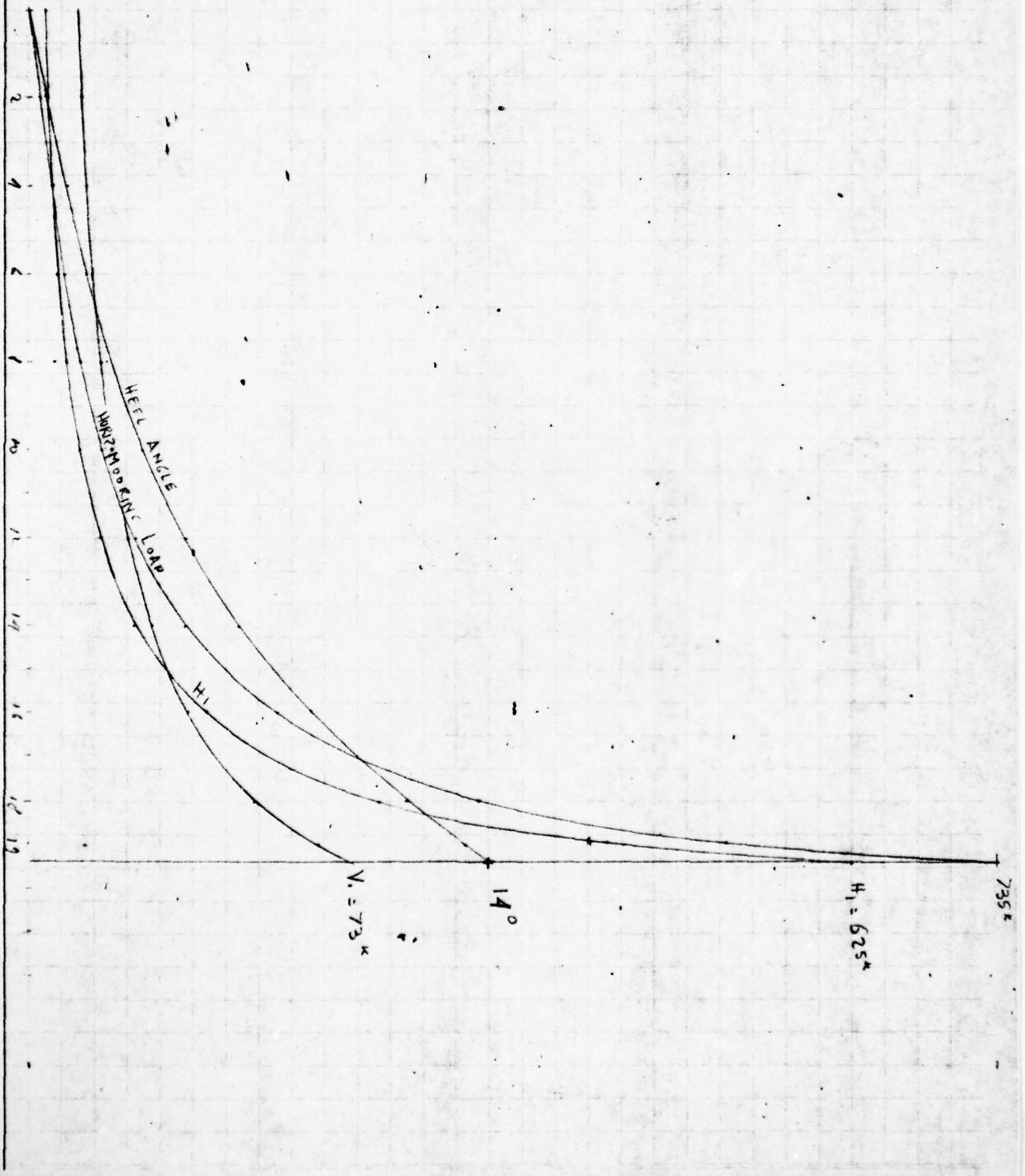
8 × 23.09 = 64.19 K Mooring Line (3.63 + 2.78) × 75 = 63.75 K

2

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

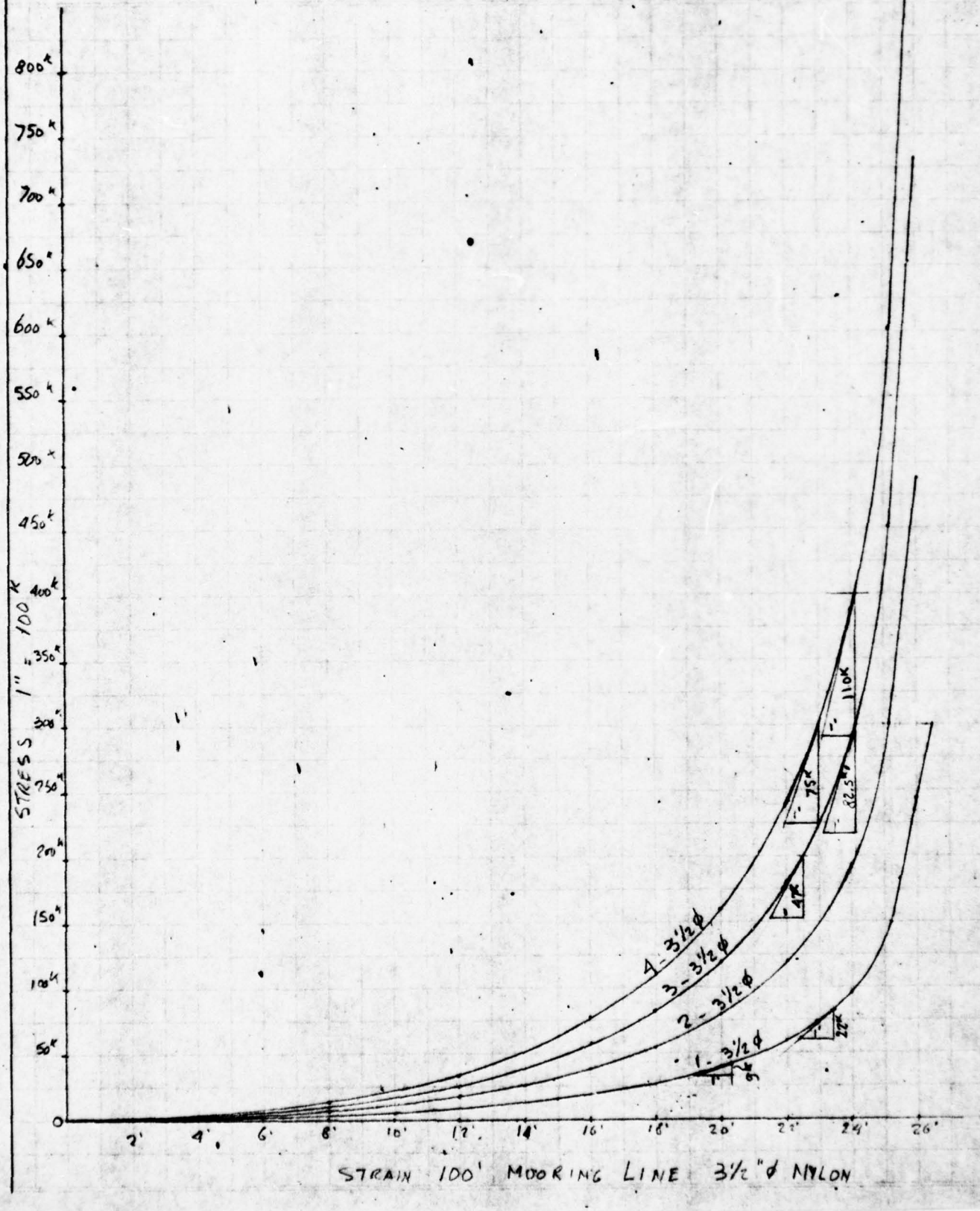
COMPANY			SHEET NO.
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE



ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY	SHEET NO
SUBJECT	
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE



SECTION IV

REVISED

BUOY DESIGN

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

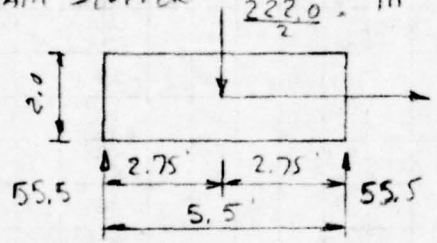
J. RAY McDERMOTT & CO., INC.

COMPANY	SHEET NO

SUBJECT: BUOY DESIGN

DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

AT HORIZ MOORING LOAD OF 735^K
MAX HORIZ CHAIN LOAD = 625^K TAN CHAIN ANGLE = $\frac{73}{625} = 0.1168$
MAX VERT CHAIN LOAD = 73^K CHAIN ANGLE = 6°40' OFF HORIZ
TOTAL CHAIN LOAD = 629^K < PROOF TEST **O.K.**
BUOY HEEL ANGLE = 14.0°.
TOTAL ANGLE OF CHAIN LOAD TO SKIRT = 14.0° + 6.7° = 20.7°
HORIZ. LOAD IN SKIRT = 629 × 0.93565 = 588.5^K
VERT. LOAD IN SKIRT = 629 × 0.35293 = 222.0^K
CHAIN STOPPER $\frac{222.0}{2} = 111^K$ SUPPORT



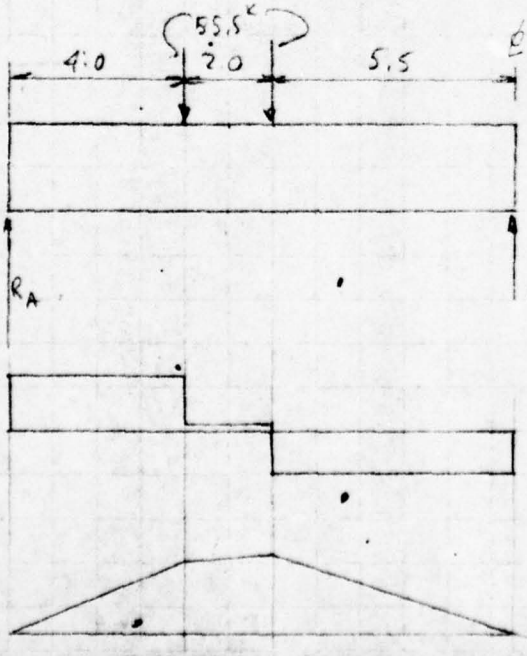
$\frac{588.5}{2} = 294.25^K$

$M_D = \frac{111.0 \times 5.5}{4} = 152.6'^K$

$S_{REQ'D} = \frac{152.6 \times 12}{24} = 76.3\ IN^3$

$I_{REQ'D} = 76.3 \times 12 = 915.6\ IN^4$
24 × ½ WEB = 576.0
FLANGES 339.6 IN^4
FLANGE AREA REQ'D $\frac{339.6}{288} = 1.2\ IN^2$

OUT BOARD CROSS OVER



$R_B = \frac{55.5 \times 4 + 55.5 \times 6}{11.5} = 48.26^K$

$R_A = \frac{55.5 \times 5.5 + 55.5 \times 7.5}{11.5} = 62.74^K$

$M_{MAX} = 48.26 \times 5.5 = 265.43'^K$

$S_{REQ'D} = \frac{265.43 \times 12}{24} = 132.72\ IN^3$

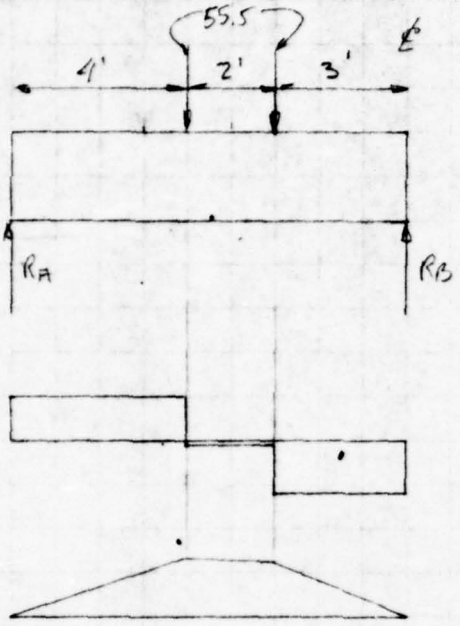
$I_{REQ'D} = 132.72 \times 12 = 1,592.6\ IN^4$
I 24 × ½ WEB 576.0 IN^4
I FLANGES 1,016.6 IN^4
FLANGE AREA REQ'D $\frac{1,016.6}{288} = 3.53\ IN^2$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY	SHEET NO
SUBJECT	
DRAWING NUMBER / COMPUTER / CHECKED BY / DATE	

INBOARD CROSSOVER



$R_A = \frac{55.5\times3 + 55.5\times5}{9} = 49.33^K$

$R_B = \frac{55.5\times4 + 55.5\times6}{9} = 61.67^K$

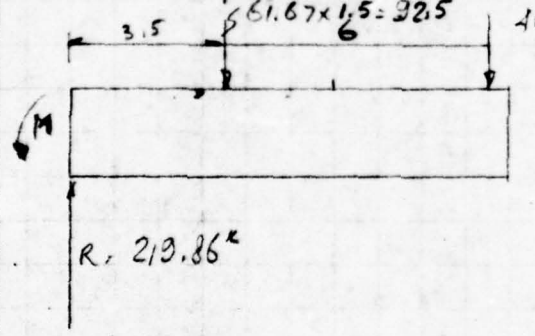
$M_{MAX} = 49.33\times4 = 197.32'K$

$S_{REQ'D} = \frac{197.32\times12}{24} = 98.66\ IN^3$

$I_{REQ'D} = 98.66\times12 =$	1,183.92
I 24x½ WEB	576.00
I FLANGES	607.92

FLANGE AREA REQ'D. $\frac{607.92}{288} = 2.11\ IN^2$

CENTER RADIAL



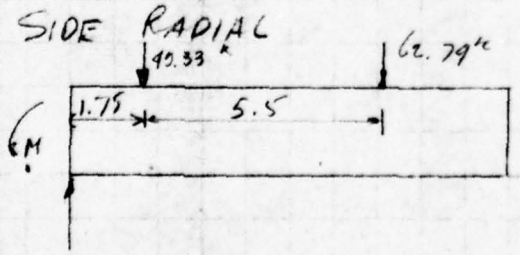
$M = 92.5\times3.5 + 72.4\times9.5 = 1,011.55\ 'K$

$S_{REQ'D} = \frac{1,011.55\times12}{24} = 505.8\ IN^3$

$I_{REQ'D} = 505.8\times12 =$	6,069.6 IN⁴
I 24x¾ WEB	869.00 IN⁴
I FLANGES	5,205.6 IN⁴

FLANGE AREA REQ'D. $\frac{5,205.6}{288} = 18\ IN^2$

SIDE RADIAL



$M = 49.33\times1.75 + 62.79\times7.25 = 541.2\ 'K$

$S_{REQ'D} = \frac{541.2\times12}{24} = 270.6\ IN^3$

$I_{REQ'D} = 270.6\times12 =$	3,247.2 IN⁴
I 29x½ WEB	576.0 IN⁴
I FLANGES	2,671.2 IN⁴

TOP & BOTT PL ¾"

FLANGE AREA REQ'D. $\frac{2,671.2}{288} = 9.28\ IN^2$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 9015

J. RAY McDERMOTT & CO., INC.

COMPANY	SHEET NO

SUBJECT: MOORING LINE DESIGN

DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

MOORING LINES TO TANKER USE NYLON HEAVY-MARINE LAY

USE S.F. OF 3 FOR MAX STATIC WIND & CURRENT LOAD

22,500 DWT TANKER		70,000 DWT TANKER	
LOADED		LOADED	
BOW LINE	STERN LINE	BOW LINE	STERN LINE
42.5^k	84.0^k	300.0^k	400.0^k
BALLAST		BALLAST	
BOW LINE	STERN LINE	BOW LINE	STERN LINE
33.0^k	73.0^k	200^k	300.0^k

USE 3½"ϕ NYLON LINE BREAK STRENGTH 300^k

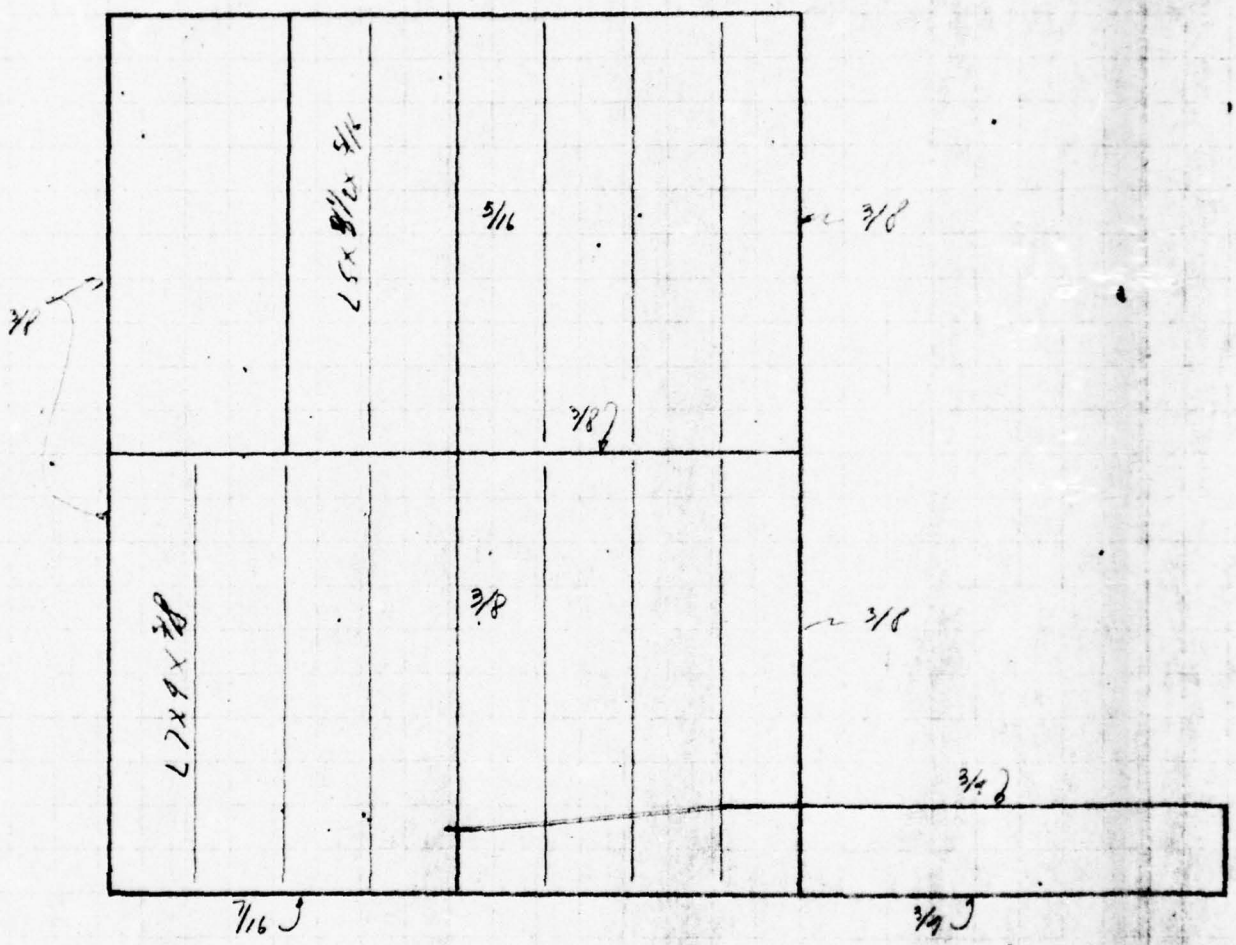
22,500 DWT TANKER		70,000 DWT TANKER	
LOADED		LOADED	
BOW LINE	STERN LINE	BOW LINE	STERN LINE
1 - 3½ϕ	1 - 3½ϕ	3 - 3½ϕ	4 - 3½ϕ
S.F. 7.0	S.F. = 3.6	S.F. = 3.0	S.F. = 3.0
S.C. 9^k/FT	S.F. 22^k/FT	S.C. = 82.5^k/FT	S.C. = 110^k/FT
BALLAST			
BOW LINE	STERN LINE	BOW LINE	STERN LINE
1 - 3½ϕ	1 - 3½ϕ	3 - 3½ϕ	4 - 3½ϕ
S.F. = 9.0	S.F. 4.1	S.F. = 4.5	S.F. 4.0
S.C. 7^k/FT	S.C. 20^k/FT	S.C. 47^k/FT	S.C. 75^k/FT

DESIGN MOORING SYSTEM FOR BREAKING STRENGTH OF 4-3½ϕ NYLON MOORING LINES WITH 6" DIFF IN LENGTH OF EACH 100' LINE TOTAL BREAKING STRENGTH = 300+240+180+135 = 855^k IN STERN MOORING LINES → 735^k HORIZONTAL MOORING FORCE AT BUOY

ENGINEERING DEPARTMENT
COMPUTATION SHEET
McD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT: Buoy Design			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE



BHD STIFF TOP LEVEL

N = 2.0 × 10.0 × 0.83 = 16.6 — ℓ = 10.0 → L 5 × 3½ × 5/16

BOTT. LEVEL

N = 2.0 × 22.0 × 0.83 = 33.2 — ℓ = 10.0 → L 7 × 4 × 3/8

BOTT STIFF INSIDE

N = 1.5 × 25.0 × 0.83 = 31.1 — ℓ = 8.0 → L 6 × 3½ × 5/16

OUTSIDE

N = 1.5 × 25.0 × 0.83 = 31.1 — ℓ = 8.7 → L 6 × 3½ × 5/16

SKIRT

N = 2.9 × 25.0 × 0.66 = 39.6 — ℓ = 10.0 → L 7 × 4 × 7/16

N = 2.9 × 23.0 × 0.66 = 36.9 — ℓ = 10.0 → L 7 × 4 × 7/16

2

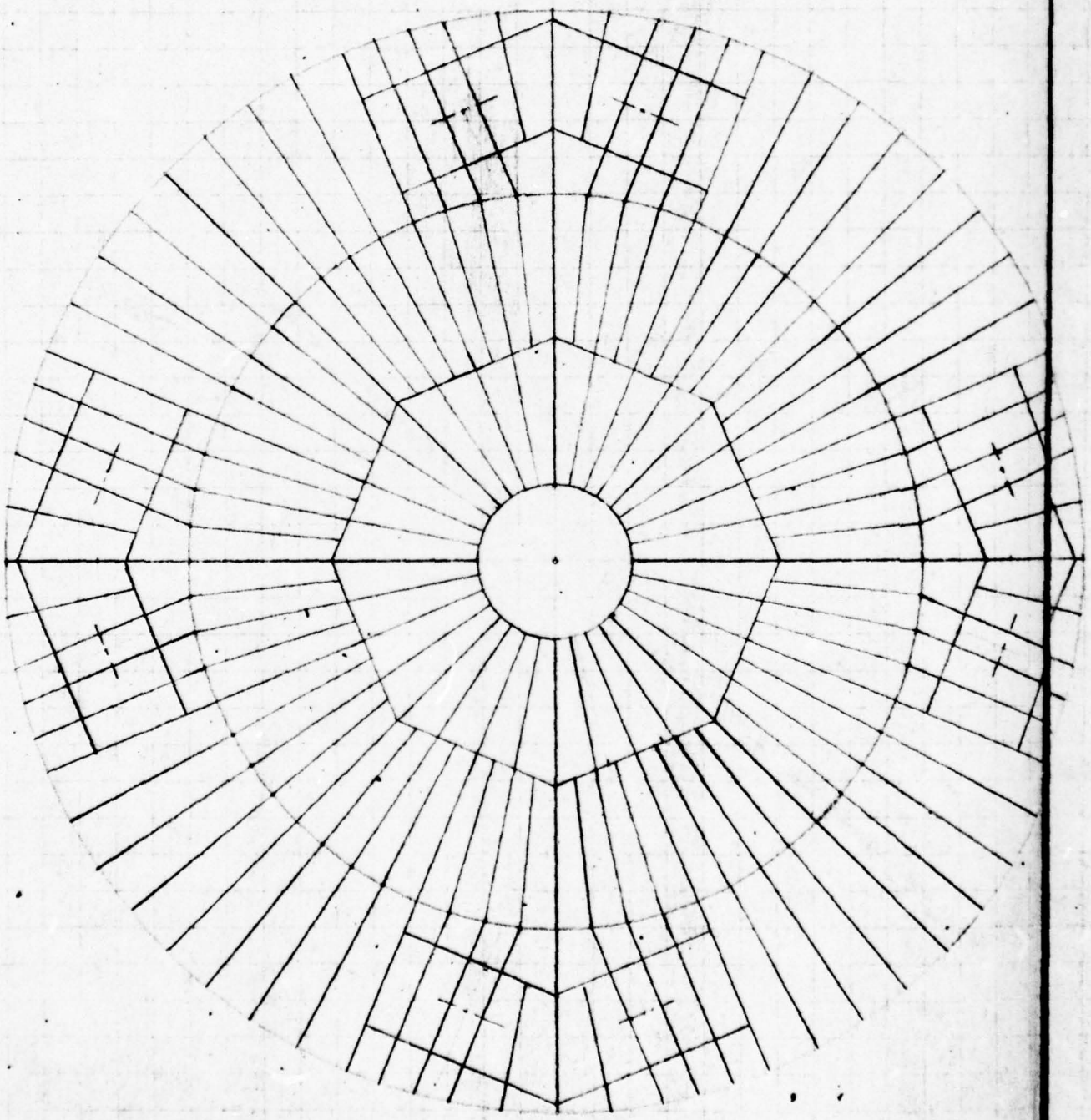
ENGINEERING DEPARTMENT
COMPUTATION SHEET

4

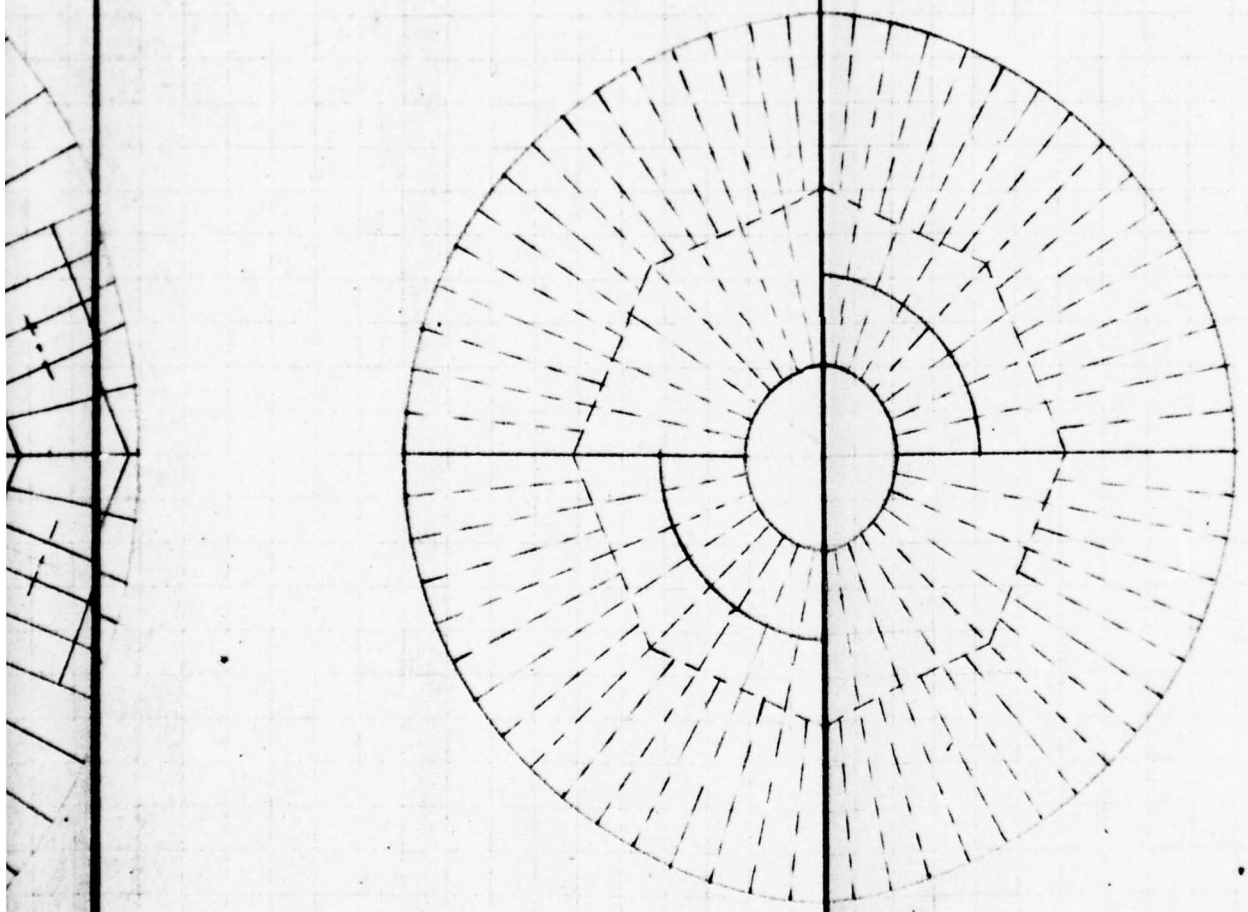
J. RAY McDERMOTT & CO., INC.

McD 14003

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE



BOTTOM FRAMING



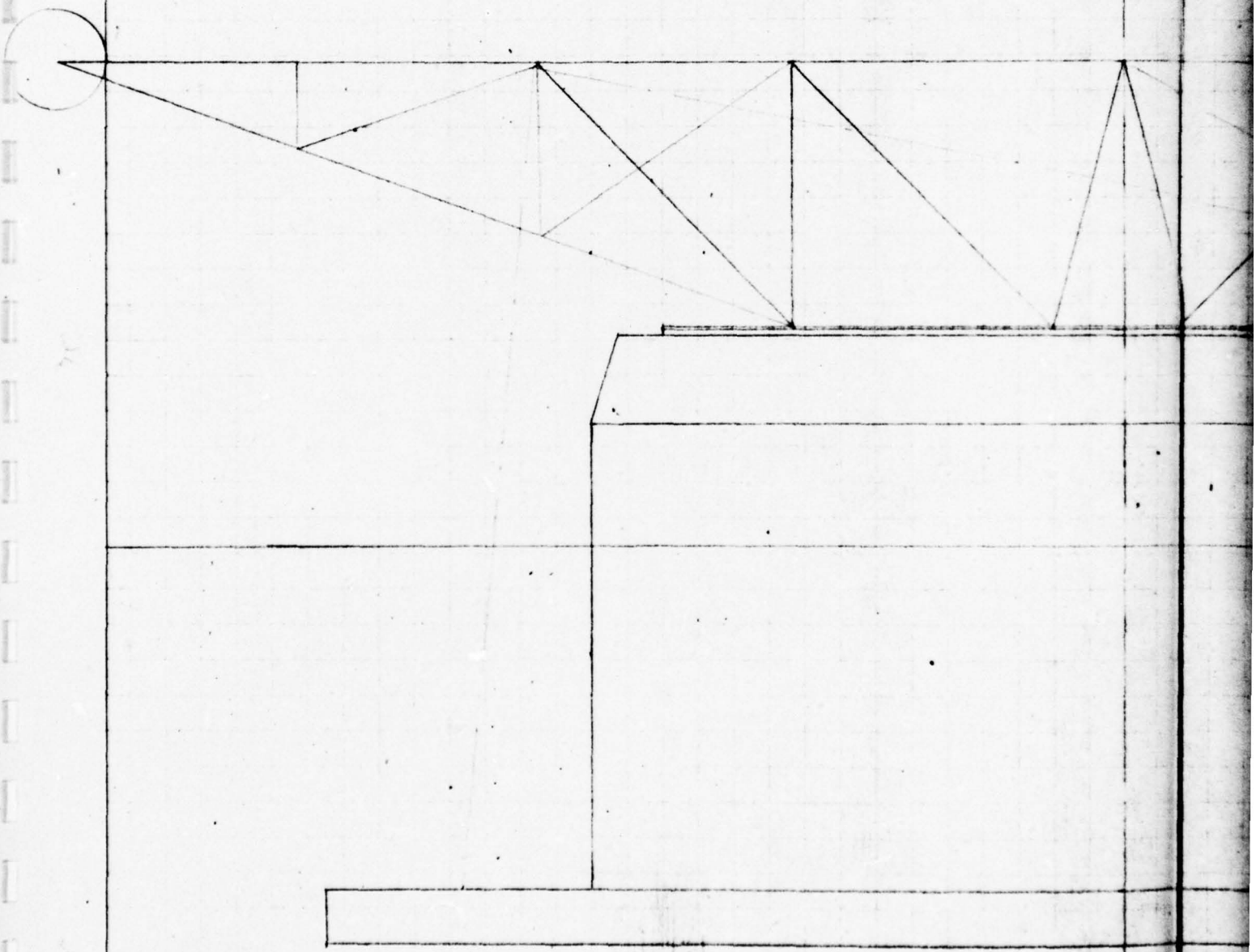
MACH DECK FRAMING

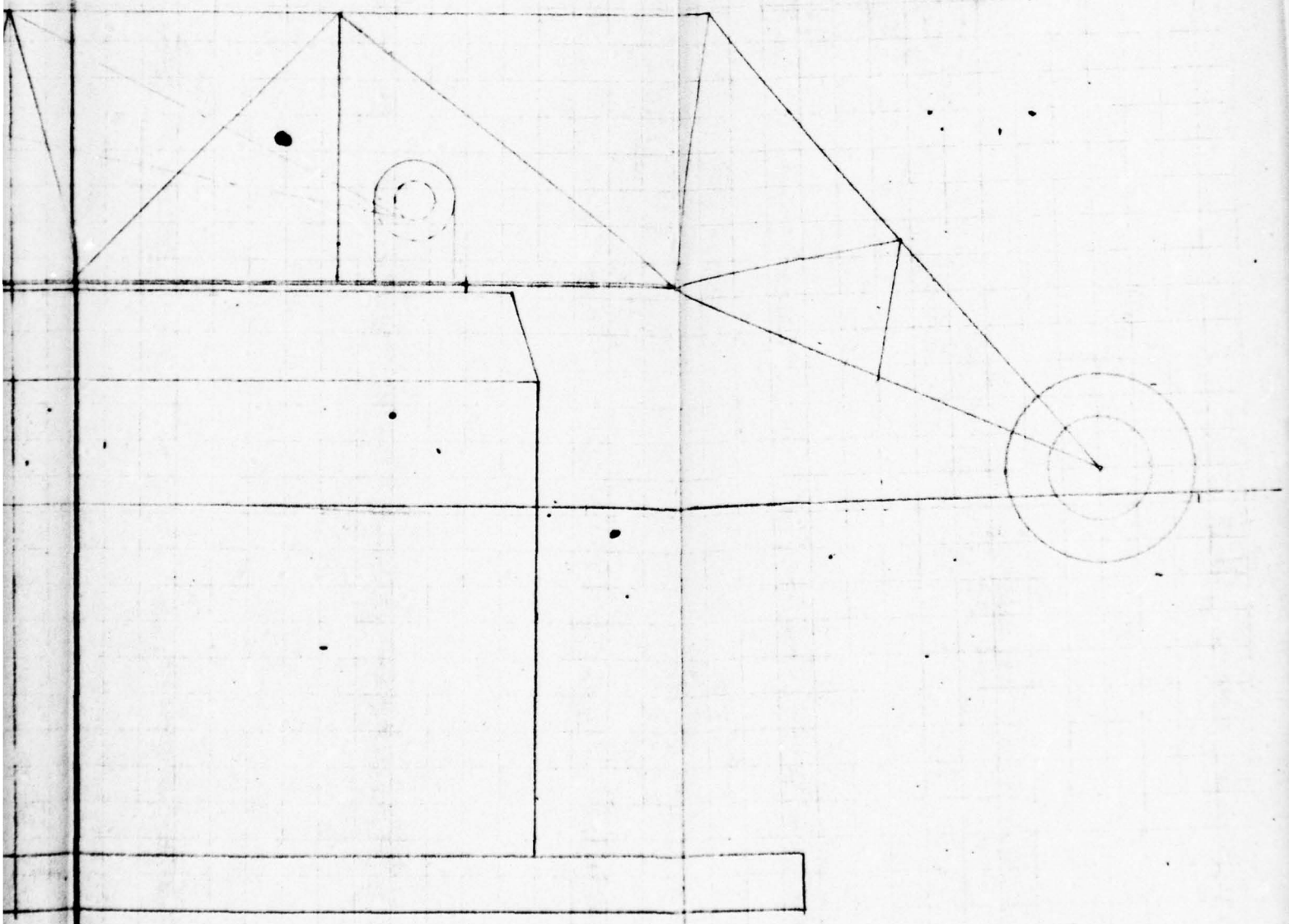
ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

3/16" = 1'-0"



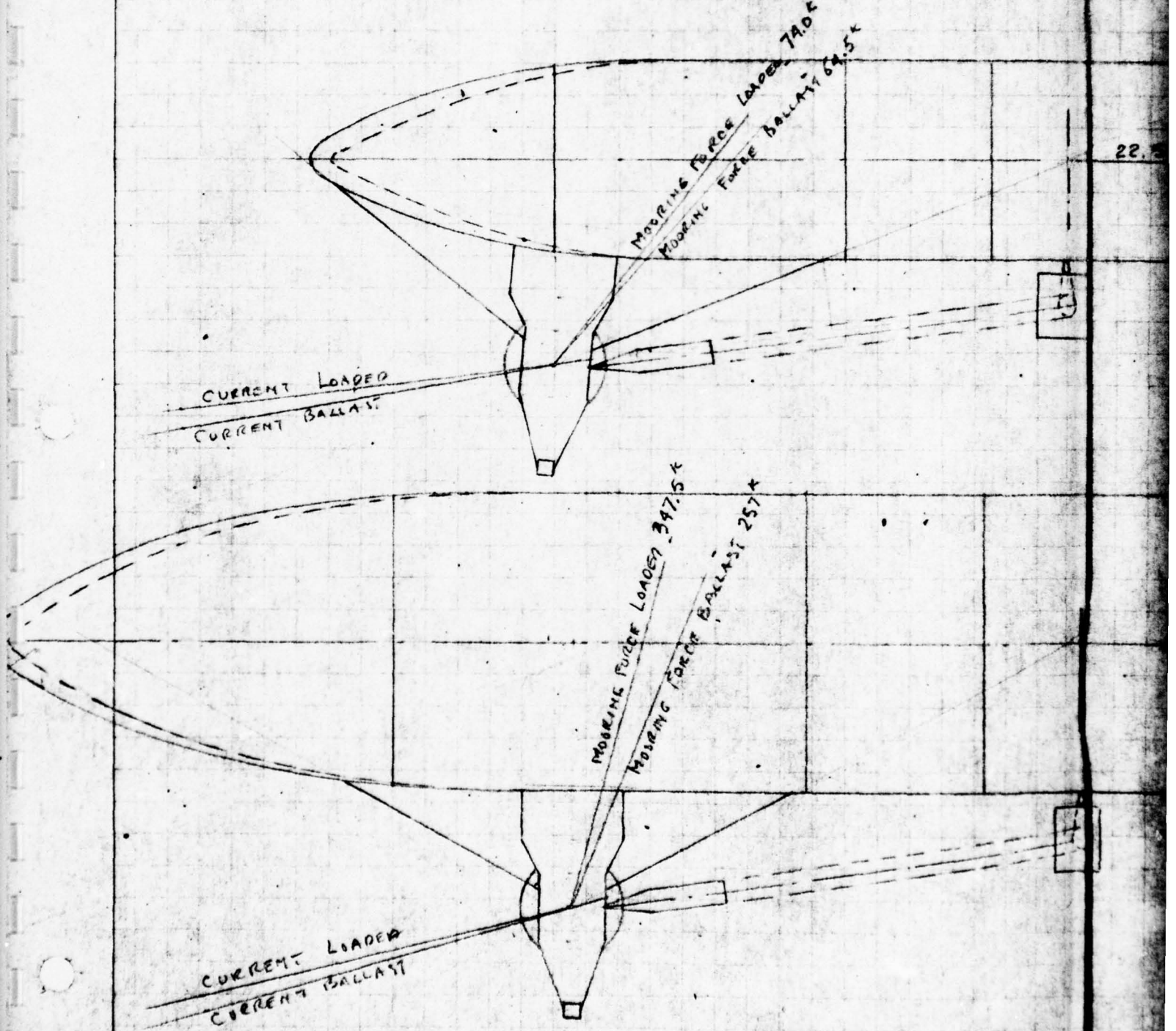


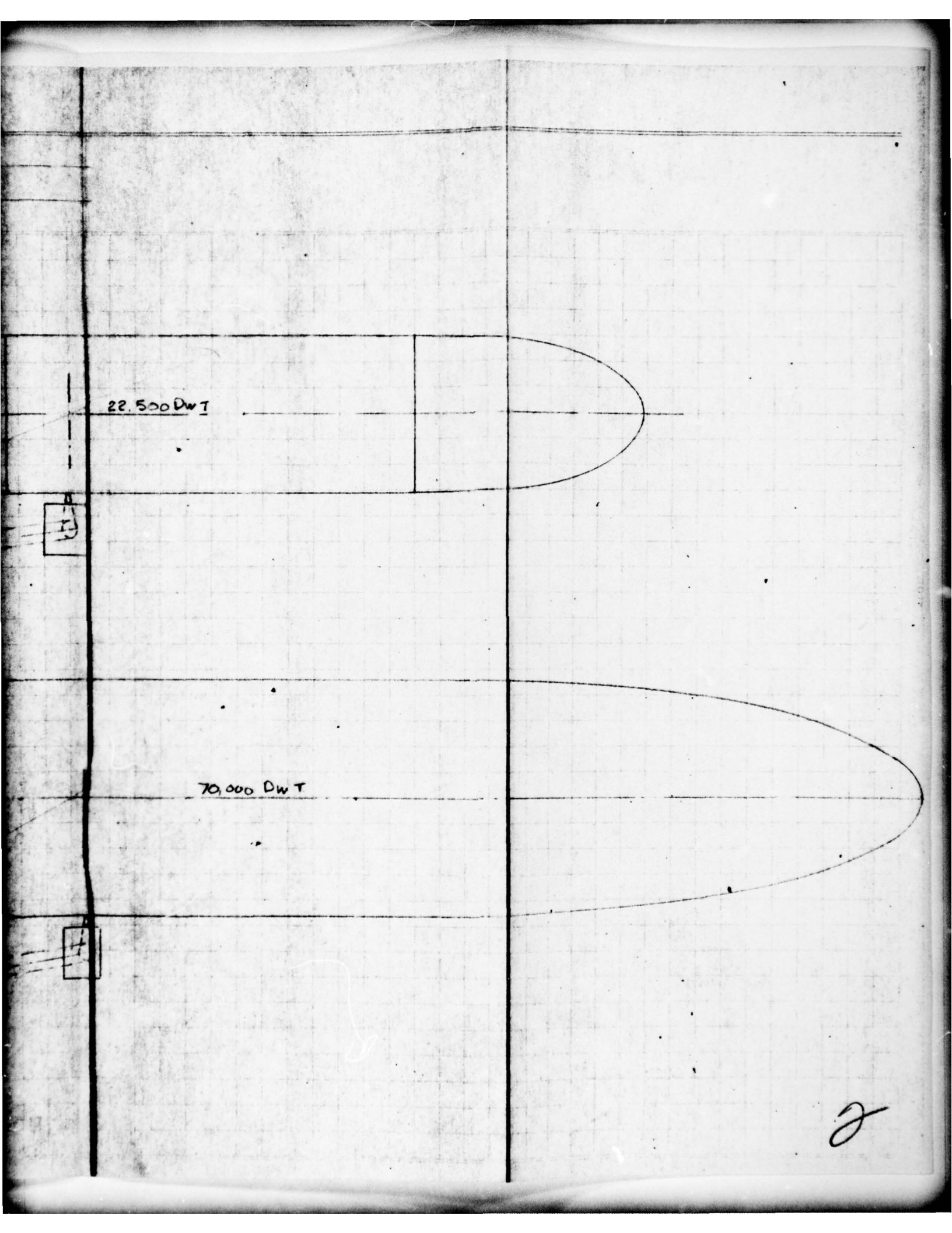
ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT: BUOY ALONG LAYOUT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

1" = 50'



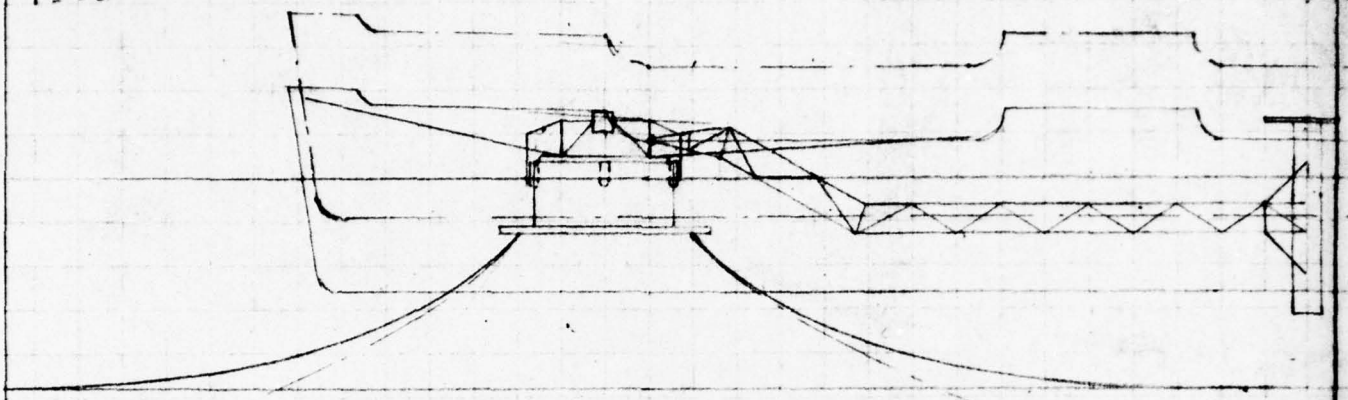

22,500 DWT
70,000 DWT

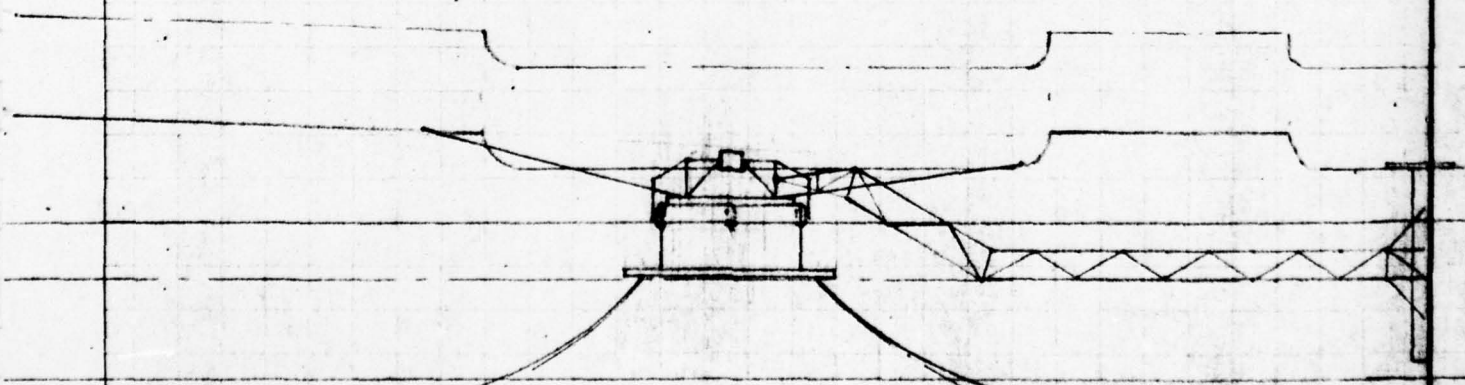
ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

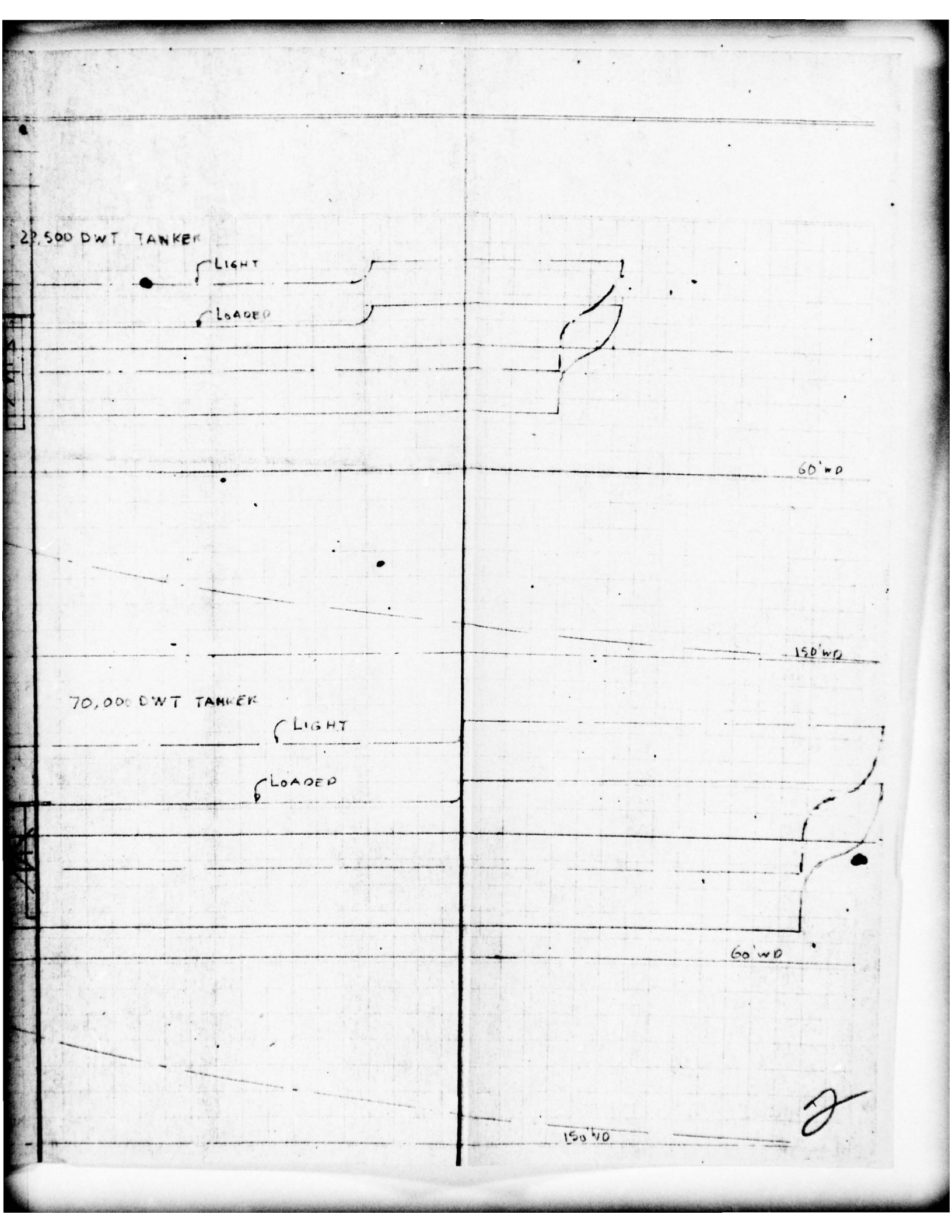
J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

1" = 50'





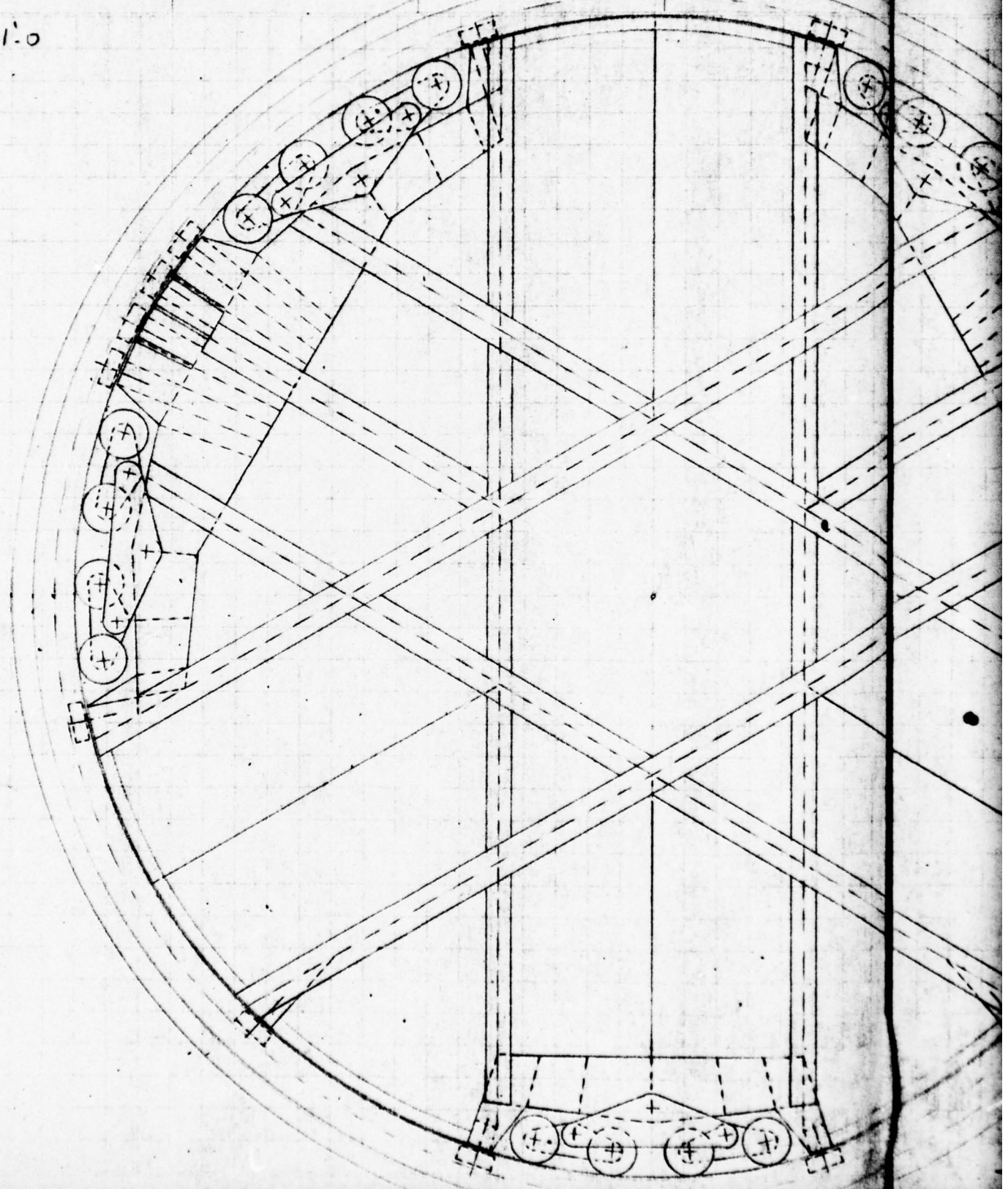

25,500 DWT TANKER
LIGHT
LOADED
60' WD
150' WD
70,000 DWT TANKER
LIGHT
LOADED
60' WD
150' WD

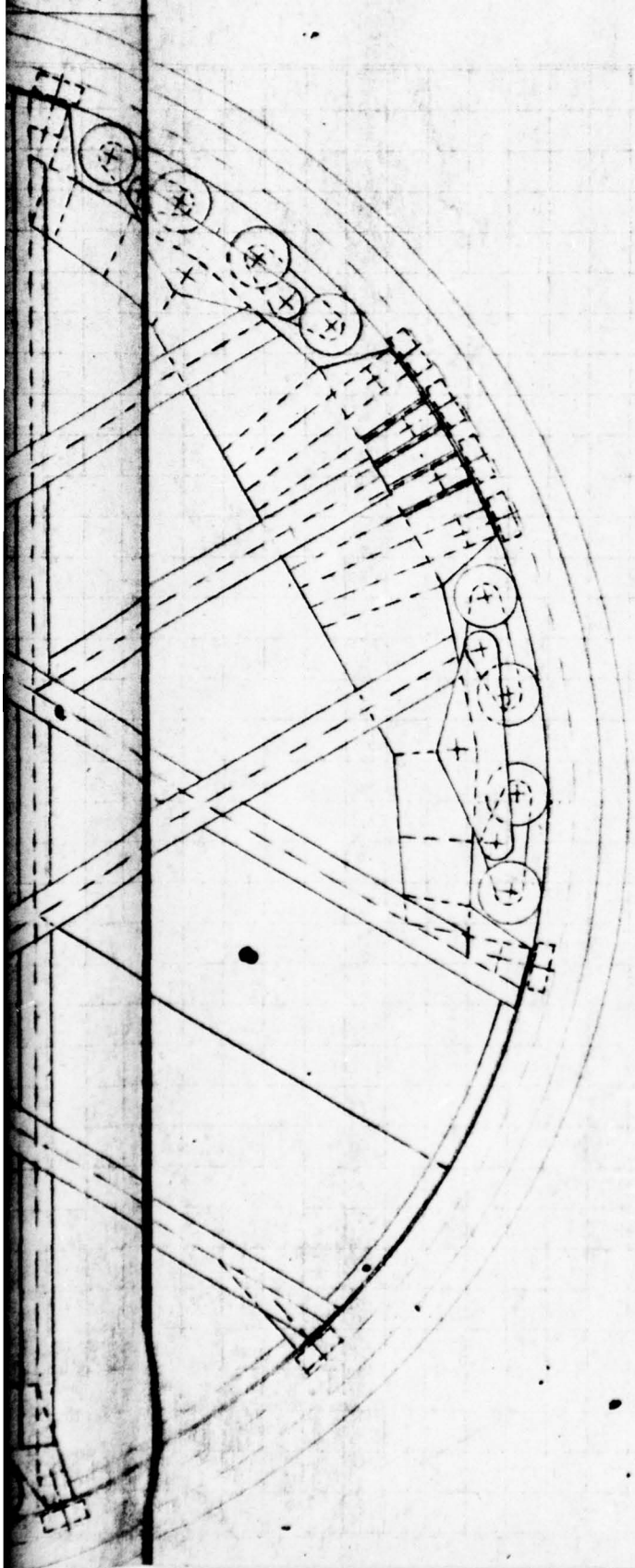
ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY	SHEET NO
SUBJECT: ROTATING DECK DESIGN	
DRAWING NUMBER	COMPUTER / CHECKED BY / DATE

1/4" = 1'-0



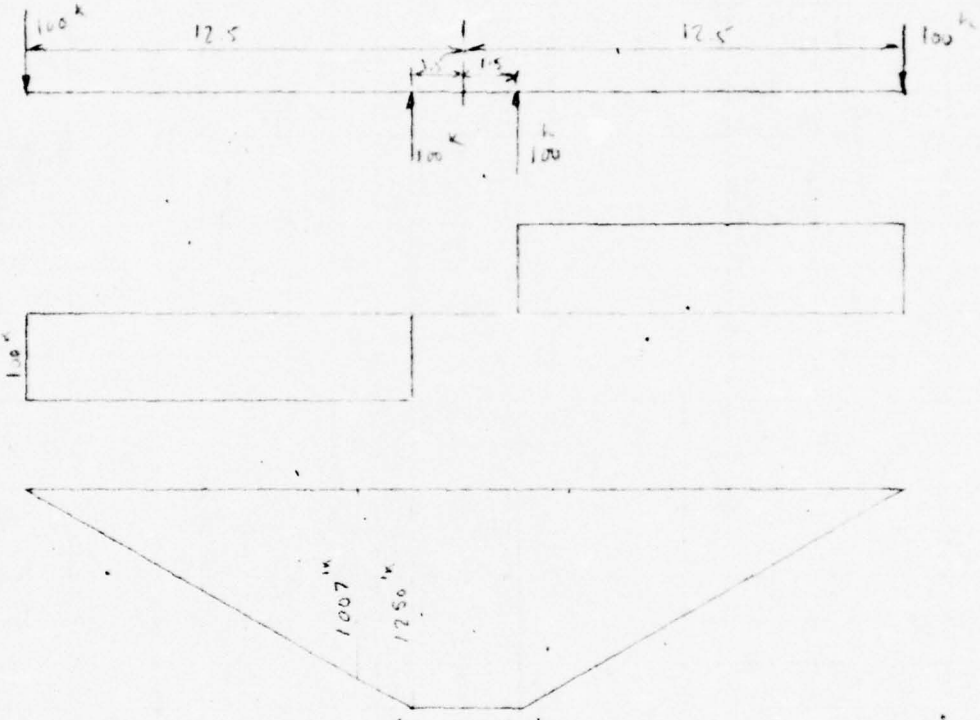


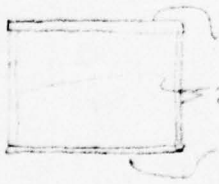
ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

VERTICAL BENDING IN GIRDER





	A	d	Ad	d	Ad²
36×78	31.5	12.9	390.6	12.9	1,843.9
2×24×78	42.0	0	1/6×78×24³ =		2,016.0
36×78	31.5	-12.9	-390.6	-12.9	1,843.9
	105.0		0		I = 11,702.8

$S = \frac{11,702.8}{12} = 975.2\ IN^3$ $\quad f_b = \frac{1007 \times 12}{975.2} = 12.9\ KSI$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

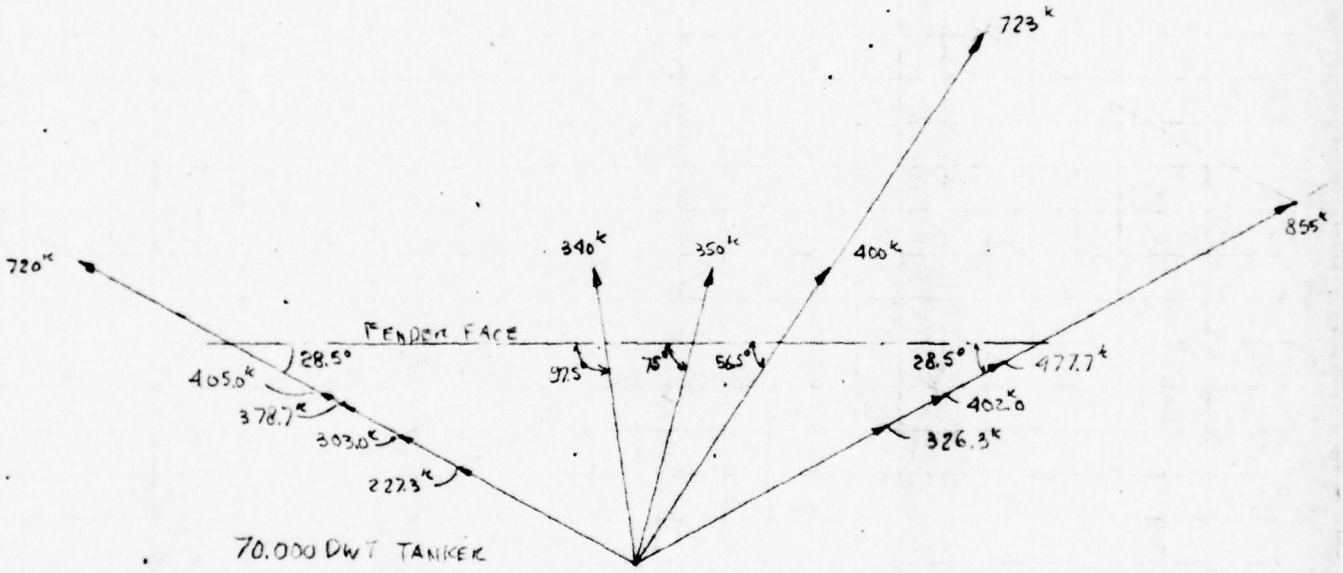
J. RAY McDERMOTT & CO., INC.

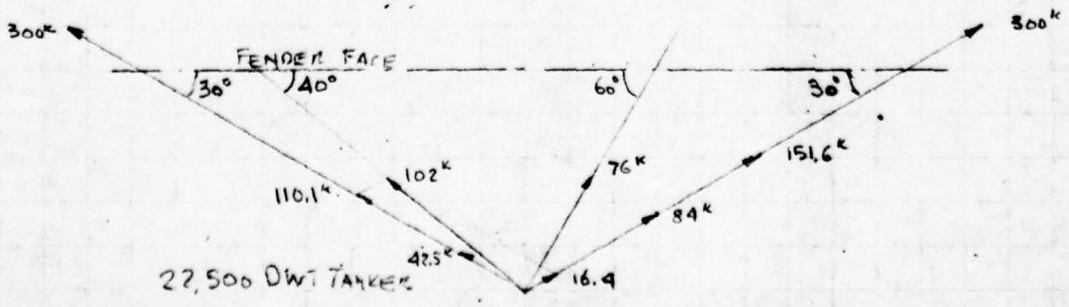
COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

LOAD FOR BOUGIE WHEELS

HORIZ. NORMAL MAX OPERATING LOAD = 480^K
MAX HORIZ LOAD = 855^K (BREAKING MOORING LINES)

VERT. NORMAL MAX OPERATING LOAD = 480 x SIN 33° = 255^K
MAX VERT LOAD = 490^K (BREAKING MOORING LINES)





ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

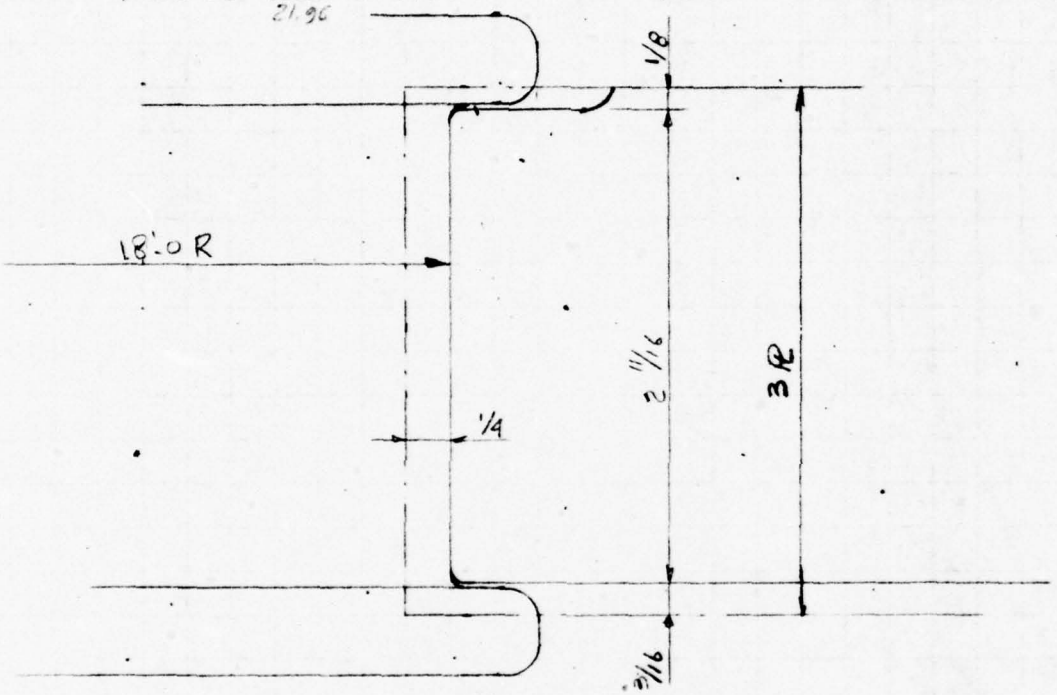
COMPANY			SHEET NO
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

HORIZ. ROLLERS

LOAD / SET OF WHEELS 118 K

TRY 18"ϕ WHEELS ALLOWABLE LOAD/1" = 1.22 × 18 = 21.96 K

WIDTH REQ'D. $\frac{112}{21.96}$ = 5.375" OR 2.6875"/WHEEL



WHEEL EQUALLIZER BEAM ℓ = 2.4'

M/BEAM = $\frac{118 \times 1.2}{2}$ = 70.8 K SREQ'D $\frac{70.8 \times 12}{24} = 35.4\,IN^3 = \frac{d \times 13^2}{6}$

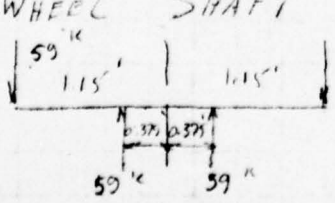
$d = \frac{35.4 \times 6}{169} = 1.25 \rightarrow 2\text{-}1\frac{1}{4}"R$

CENTER EQUALLIZER BEAM ℓ 4.75'

M/BEAM = $\frac{236 \times 2.37}{2}$ = 280.25 K SREQ'D = $\frac{280.25 \times 12}{24} = 140.13 = \frac{d \times 21^2}{6}$

$d = \frac{140.13 \times 6}{441.0} = 1.9 \rightarrow 2\text{-}2"R$

WHEEL SHAFT



M = 59 × 1.15 − 59 × 0.375 = 45.725 K

SREQ'D $\frac{45.725 \times 12}{24} = 22.86\,IN^3 = 0.09817\,d^3$

$d^3 = \frac{22.86}{0.09817} = 232.85\,IN^3$ $d = 6.16" \rightarrow 6\frac{1}{4}\phi$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
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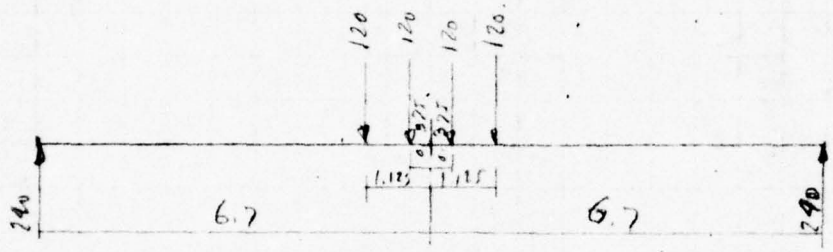
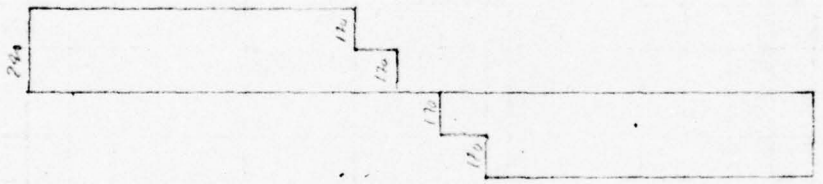
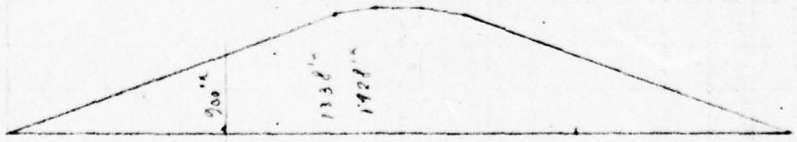
HORIZ BENDING IN GIRDER







24×3/8	21.0	12.9			3,229.0
2×36×3/8	63.0		1/6×3/8×36³		6,804.0
24×3/8	21.0	12.4			3,229.0
	105.0	0	0	I =	13,262.0

$S = \frac{13,262.0}{18} = 736.8\ IN^3$

$f_b = \frac{200 \times 12}{736.8} = 14.7\ KSI$

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SHEAR @ EDGE OF WHEEL = 59 K

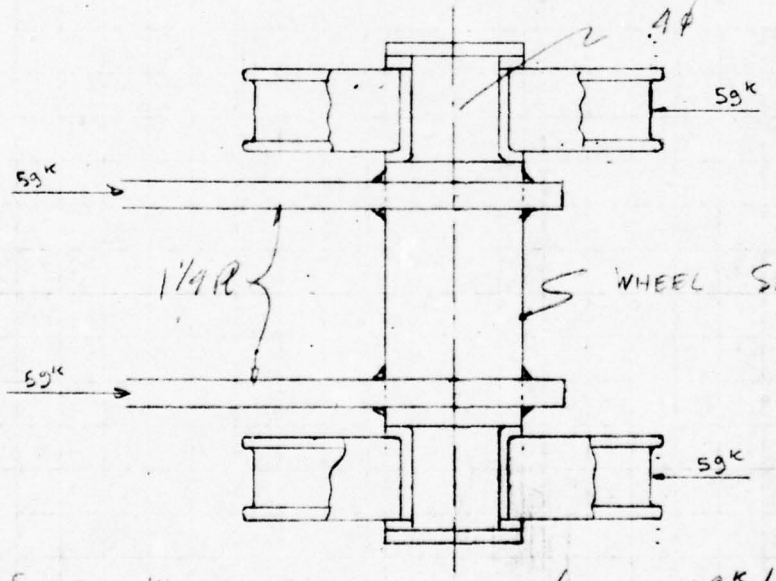
AREA REQ'D = $\frac{59}{15}$ = 3.93 IN² → 2" ϕ

BENDING @ EDGE OF WHEEL = 59 × 2.375 = 140.0125 "K

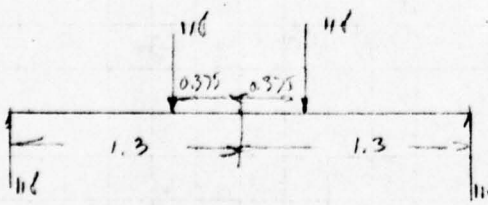
SREQD = $\frac{140.0125}{24}$ = 5.83 IN³ = 0.098175 d³

d³ = $\frac{5.83}{0.098175}$ = 59.4 IN³ d = 3.9 → 4" ϕ

BEARING LOADING = $\frac{59}{1 \times 4.25}$ = 3.47 KSI



CENTER SHAFT WHEEL EQUALIZER LOAD 118 K/BEAM



M = 118 × (1.3 + 0.375) = 109.15 "K

SREQD = $\frac{109.15 \times 12}{24}$ = 54.575 IN³ = 0.098175 d³

d³ = $\frac{54.575}{0.098175}$ = 555.90 IN³ d = 8.23 → 8 1/4

M AT EDGE OF BEARING 118 × 3 = 354 "K SREQD $\frac{354}{24}$ = 14.75 IN³ = 0.098175 d³

d³ = $\frac{14.75}{0.098175}$ = 150.24 d = 5.35 → 5 3/8

BEARING LOADING = $\frac{118}{5\frac{3}{8} \times 5\frac{1}{2}}$ = 3.99 KSI

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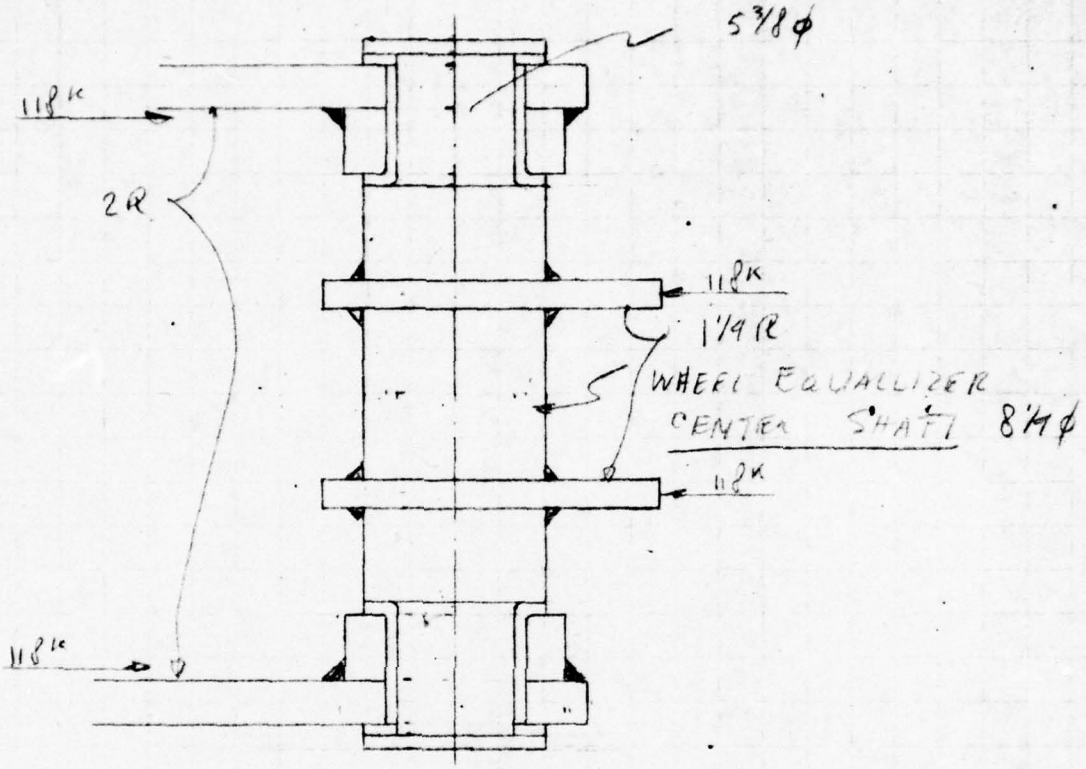
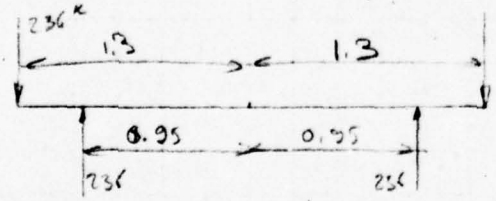


CENTER SHAFT CENTER EQUALLIZER



$M = 236 \times (1.3 - 0.95) = 82.6^{IK}$

$SREQ'D = \frac{82.6 \times 12}{24} = 41.3 IN^3 = 0.098175 d^3$

$d^3 = \frac{41.3}{0.098175} \quad 420.7 \quad d = 7.5$

SHEAR @ EDGE OF BEARING: 236 AREA REQ'D $= \frac{236}{15} = 15.73 \rightarrow 4\frac{1}{2}\phi$

BENDING @ EDGE OF BEARING: $236 \times 2.75 = 649^{IK}$ $SREQ'D \frac{649}{24} = 27.0 = 0.098175 d^3$

$d^3 = \frac{27.0}{0.098175} = 275 IN^3 \quad d = 6.5\phi$

BEARING LOADING $= \frac{236}{6.5 \times 2.5} = 6.6 KSI$

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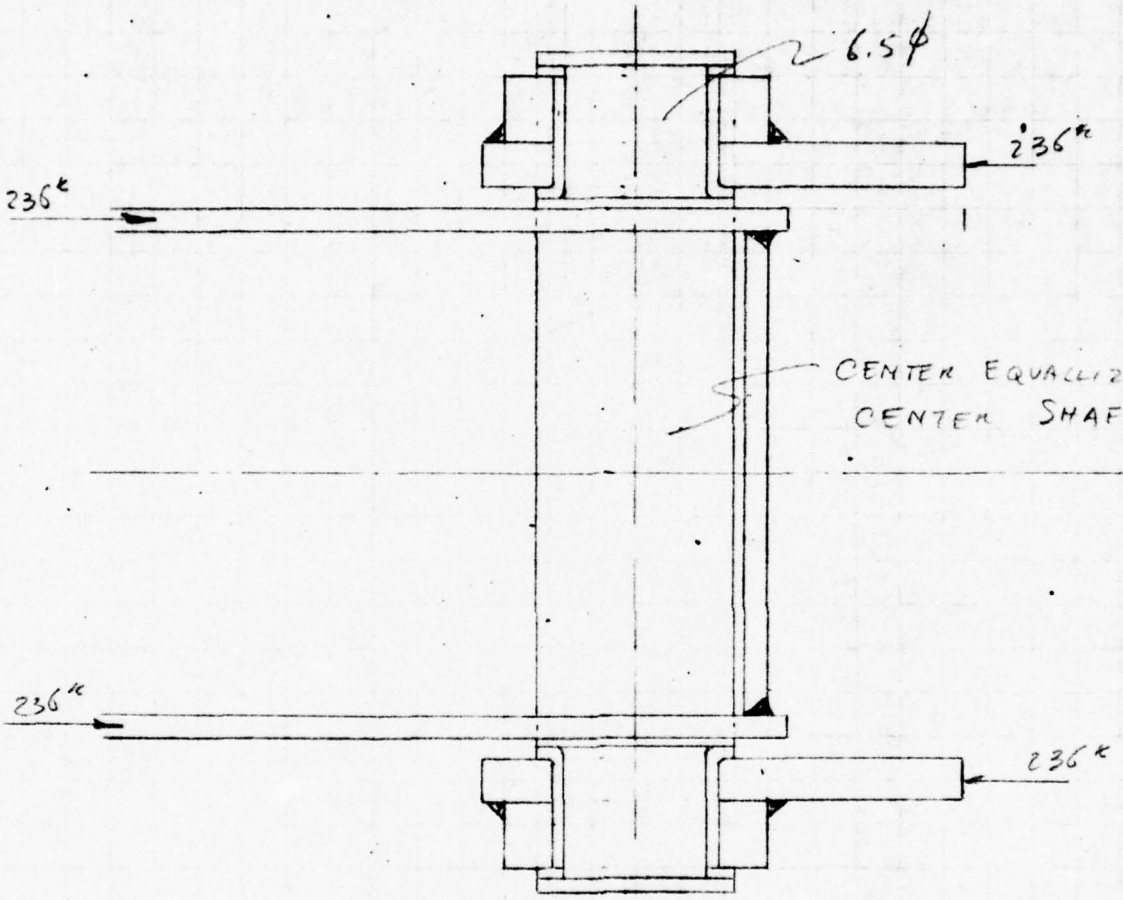

BEARING IN GIRDER $\frac{236}{16 \times 2}$ = 9.8 KSI OK

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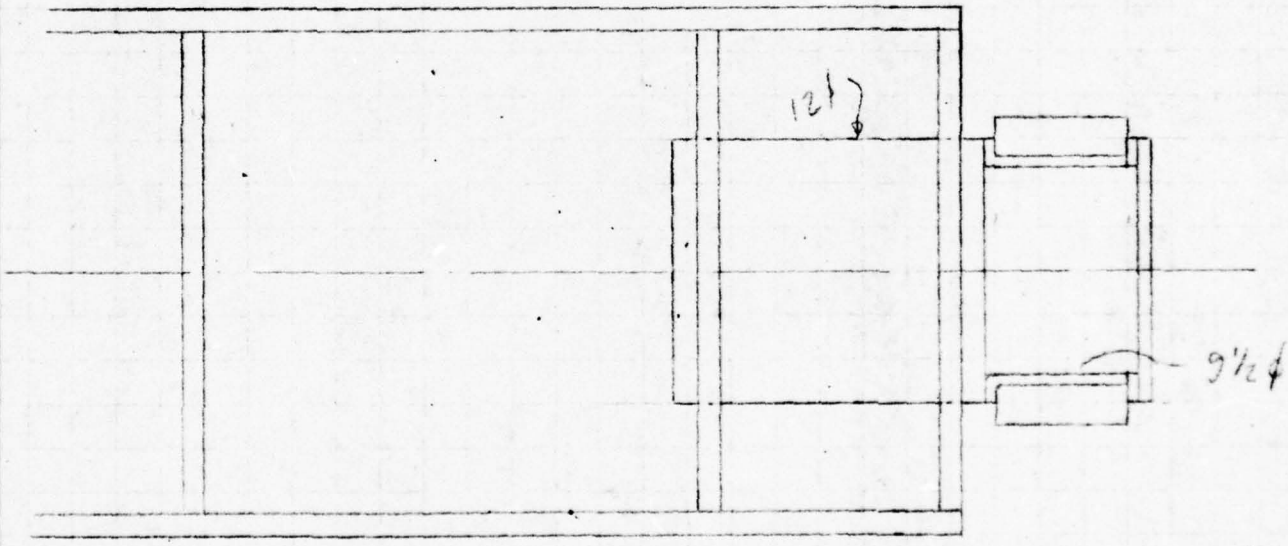
VERT. ROLLERS 100^K / ROLLER → 190 × 6

ALLOWABLE = 1.22 × 19 × 6 = 102.5^K OK

BENDING @ FACE OF BEARING = $\frac{100 \times 3.25}{2}$ = 162.5^{IK}

SREQ'D = $\frac{162.5 \times 12}{24}$ = 81.25 = 0.098175 d^3

$d^3 = \frac{81.25}{0.098175}$ = 827.6 IN^3 d = 9.4 → 9½



WHEEL 0.5 × 523.1 = 261.6

− 0.5 × 241.0 = 120.5

141.1

SHAFT 1.2 × 384.5 = 461.4

0.6 × 241.0 = 120.5

581.9

TOTAL 723.0#

16 REQ'D = 11,568#

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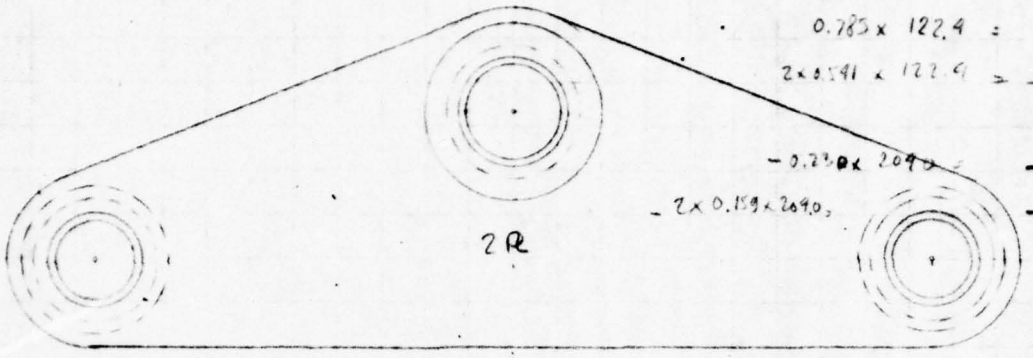
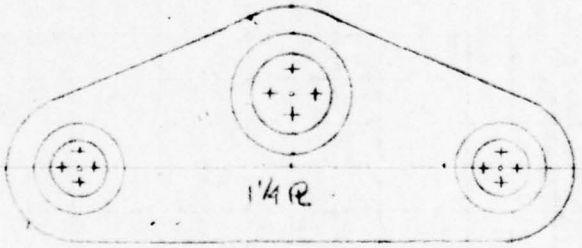


2.8 × 5.5 × 81.6 = 1,256.6
0.785 × 122.4 = 96.1
2 × 0.541 × 122.4 = 132.4
1,485.1
- 0.738 × 209.0 = - 46.9
- 2 × 0.159 × 209.0 = - 64.9
1,373.3#

CENTER EQUALLIZER BEAM



WHEEL EQUALLIZER BEAM

2.08 × 3 × 51 = 318.2
2 × 0.77 × 104.3 = 169.8
4 × 0.46 × 42.7 = 78.6
1.375 × 181.8 = 250.0
2 × 0.46 × 77.2 = 71.0
882.6#

CENTER SHAFT 2.0 × 384.5 = 769.0
2 × 0.46 × 112.8 = 103.8
872.6#

WHEEL π × 0.75² × 153.0 = 270.8#

WT OF 1 BOGIE ASSEMBLE.

2 × 1,373.3 = 2,746.6
1 × 872.6 = 872.6
2 × 882.6 = 1,765.2
2 × 318.2 = 636.4
8 × 270.8 = 2,166.4
8,187.2#

5 REQ'D - 5 × 8,187.2 = 40,936.0#

DONUT BUOY INVESTIGATION

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY | SHEET NO

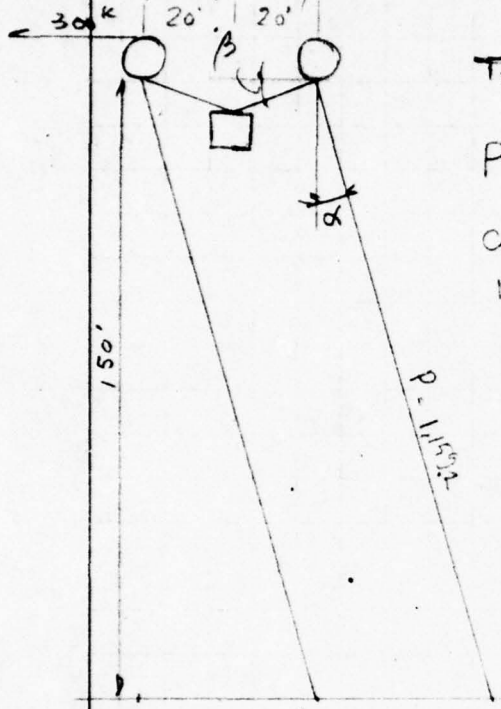
SUBJECT: DONUT BUOY INVESTIGATION

DRAWING NUMBER | COMPUTER: NdB | CHECKED BY | DATE: 4-25-66

DONUT BUOY 150' WD

MAX. EXCURSION 40' MAX. MOORING LOAD 300^k

40' ϕ β_{MIN} 20°



$\tan\alpha = \frac{40}{150} = 0.26667 \quad \alpha = 15°$

$P = \frac{300}{\sin 15°} = \frac{300}{0.2588} = 1,159.2^k$

COUNTER WT = $1,159.2 \times \sin 20° = 1,159.2 \times 0.3420 = 396.4^k$

NET BUOYANCY REQ'D.

$= 396.4 + 1,159.2 \times \cos 15° = 1,516.1^k$

$40'\phi = 40 \times 3.14 = 125.6'$

NET DISPL/FT $= \frac{1,600}{125.6} = 12.74^k$

WT OF BUOY/FT $= \pi \times D \times 0.026 = 0.0816D$

DISPL/FT $= \frac{\pi D^2}{4} \times 1.064 = 0.0835D^2 - 0.0502D^2$

$0.0502D^2 - 0.0816D - 12.74 = 0$

$D = \frac{0.0816 \pm \sqrt{0.0816^2 - (4 \times 0.0502 \times -12.74)}}{2 \times 0.0502} = \frac{0.0816 \pm \sqrt{0.0067 + 2.5592}}{0.1004} =$

$= \frac{0.0816 \pm 1.6215}{0.1004} = \frac{1.6831}{0.1004} = 16.76'$ SAY $17'\phi$

$L_1 = \frac{150}{\cos\alpha} = \frac{150}{0.9659} = 155.3' \quad \Delta L = 5.3'$

$L_2 = \frac{20}{\cos\beta} = \frac{20}{0.9397} = 21.3' \quad L_2' = 21.3 + 5.3 = 26.6'$

$\cos\beta' = \frac{20}{26.6} = 0.7519 \quad \beta' = 41° 15'$

$P' = \frac{396.4}{\sin\beta} = \frac{396.4}{0.6594} = 601.2^k$

NET BUOYANCY $= 396.4 + 601.2 = 997.6^k$

Δ BUOYANCY $= 1,516.1 - 997.6 = 518.5^k$

ENGINEERING DEPARTMENT
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CHECK DONUT BUOY 150' WD

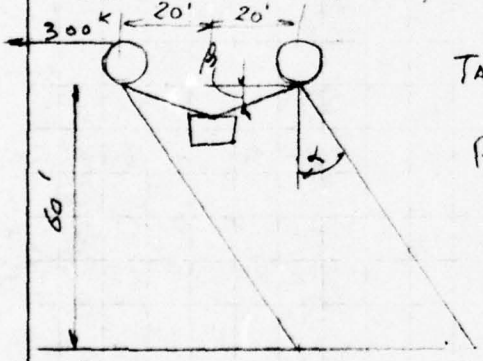
40' ℄ DIAM 17' ℄ RING COUNTER WT 400^k

PLATE AREA = $\pi^2 \times 40 \times 17 = 6,709.5^{Ft^2}$

7/8R + 25% STIFF = 6,709.5 × 1.25 × 15.3 =	128.1^k
ROTATING DECK	100.0^k
SWIVEL	25.0^k
SHEAVES	25.0^k
ANCHOR CHAIN	25.0^k
ANCHOR CHAIN LOAD	1,119.8^k
COUNTER WT	400.0^k
TOTAL DISPL REQ'D	1,822.9^k

DISPL. = $\frac{1}{4}\pi^2 \times 40 \times 17^2 \times 0.064 = 1,825.0^k$ OK

USE SAME BUOY FOR 60' WD.



TAN $\alpha = \frac{40}{60} = 0.6667$ $\alpha = 33^\circ 50'$

$P = \frac{300}{\sin 33^\circ 50'} = \frac{300}{0.5560} = 538.8^k$

COUNTER WT = $538.8 \times \sin 20^\circ = 538.8 \times 0.3420 = 184.3^k$

NET BUOYANCY REQ'D = $184.3 + 538.8 \times \cos 33^\circ 50' =$
$= 184.3 + 538.8 \times 0.8307 = 189.2 + 447.6 = 631.9^k$

DISPL. AVAILABLE	1,825.0^k	
REQ'D	− 631.9	
TOTAL BUOY WT	− 278.1^k	
ANCHOR CHAIN	− 13.0	
BALLAST	902.0^k	

$L_1 = \frac{60}{\cos 33^\circ 50'} = \frac{60}{0.8307} = 72.2'$

$L_2 = \frac{20}{\cos 20} = 21.3$ CHAIN 72.2 + 21.3 = 93.5'

	150' WD	60' WD
BUOY WT	278.1^k	278.1^k
COUNTER WT	400.0^k	185.0^k
No. ANCHOR 100^k/ANCHOR	12	6
TOTAL LGTH CHAIN 12 × 180 = 2,160'		6 × 95 = 570

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0° $L_1 = 150'$ $L_2 = 26.6'$ $CW = 400^k$

$\cos\beta = \frac{20}{26.6} = 0.7519$ $\beta = 41^\circ 15'$

$P_C = \frac{400}{\sin\beta} = \frac{400}{0.6594} = 606.6^k$

$P_H = 606.6 \times \sin 0^\circ = 0$

5° $L_1 = \frac{150}{\cos 5^\circ} = 150.6'$ $L_2 = 26.0'$ $CW = 400^k$

$\cos\beta = \frac{20.0}{26.0} = 0.7692$ $\beta = 39^\circ 40'$

$P_C = \frac{400}{\sin\beta} = \frac{400}{0.6383} = 626.7^k$

$P_H = 626.7 \times \sin 5^\circ = 626.7 \times 0.0872 = 54.6^k$

$\Delta_H = 150 \tan 5^\circ = 150 \times 0.0875 = 13.1'$

10° $L_1 = \frac{150}{\cos 10^\circ} = 152.3'$ $L_2 = 29.3$

$\cos\beta = \frac{20}{24.3} = 0.8230$ $\beta = 34^\circ 35'$

$P_C = \frac{400}{\sin\beta} = \frac{400}{0.5636} = 704.7^k$

$P_H = 704.7 \times \sin 10^\circ = 704.7 \times 0.1737 = 122.4^k$

$\Delta_H = 150 \tan 10^\circ = 150 \times 0.1763 = 26.4'$

15° $L_1 = \frac{150}{\cos 15^\circ} = 155.3'$ $L_2 = 21.3$

$\cos\beta = \frac{20.0}{21.3} = 0.9390$ $\beta = 20^\circ$

$P_C = \frac{400}{\sin 20^\circ} = \frac{400}{0.3420} = 1,169.6^k$

$P_H = 1,169.6 \times \sin 15^\circ = 1,169.6 \times 0.2588 = 302.7^k$

$\Delta_H = 150 \tan 15^\circ = 150 \times 0.2680 = 40.2'$

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MCD 5015

J. RAY McDERMOTT & CO., INC.

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SUBJECT			
DRAWING NUMBER	COMPUTER: NdB	CHECKED BY	DATE: 4-25-66

60' WD
BUOY 40' ℄ DIAM × 17'ℓ
COUNTER WT 185ᵏ
6 ANCHORS

0° $L_1 = 60'$ $L_2 = 33.5'$ $CW = 185^k$

$\cos\beta = \frac{30.0}{33.5} = 0.5970$ $\beta = 53° 20'$

$P_C = \frac{185}{\sin\beta} = \frac{185}{0.8021} = 230.6^k$

$P_H = 230.6 \times \sin 0° = 0^k$

5° $L_1 = \frac{60}{\cos 5°} = \frac{60}{0.9962} = 60.2'$ $L_2 = 33.3'$ $C_W = 185^k$

$\cos\beta = \frac{20}{33.3} = 0.6006$ $\beta = 53°$

$P_C = \frac{185}{\sin\beta} = \frac{185}{0.7986} = 231.7^k$

$P_H = 231.7 \times \sin 5° = 231.7 \times 0.0872 = 20.2^k$

$\Delta_H = 60 \times \sin 5° = 60 \times 0.0875 = 5.3'$

10° $L_1 = \frac{60}{\cos\alpha} = \frac{60}{0.9848} = 60.9'$ $L_2 = 32.6'$

$\cos\beta = \frac{20}{32.6} = 0.6135$ $\beta = 52° 10'$

$P_C = \frac{185}{\sin\beta} = \frac{185}{0.7898} = 234.2^k$

$P_H = 234.2 \times \sin 10° = 234.2 \times 0.1737 = 40.7'$

$\Delta_H = 60 \times 0.1763 = 10.6'$

15° $L_1 = \frac{60}{\cos\alpha} = \frac{60}{0.9659} = 62.1$ $L_2 = 31.4'$

$\cos\beta = \frac{20}{31.4} = 0.6369$ $\beta = 50° 30'$

$P_C = \frac{185}{\sin\beta} = \frac{185}{0.7716} = 239.8^k$

$P_H = 239.8 \times \sin 15° = 239.8 \times 0.2588 = 62.1^k$

$\Delta_H = 60 \times 0.2680 = 16.8'$

ENGINEERING DEPARTMENT
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20° $L_1 = \frac{60'}{\cos 20°} = \frac{60}{0.9397} = 63.9'$ $L_2 = 29.6'$

$\cos\beta = \frac{20.0}{29.6} = 0.6757$ $\beta = 47° 30'$

$P_C = \frac{185}{\sin\beta} = \frac{185}{0.7373} = 250.9$

$P_H = 250.9 \times \sin 20° = 250.9 \times 0.3420 = 85.8^K$

$\Delta_H = 60 \times 0.3640 = 21.8'$

25° $L_1 = \frac{60}{\cos 25} = \frac{60}{0.9063} = 66.2$ $L_2 = 27.3$

$\cos\beta = \frac{20}{27.3} = 0.7326$ $\beta = 42° 50'$

$P_C = \frac{185}{\sin\beta} = \frac{185}{0.6799} = 272.1^K$

$P_H = 272.1 \times \sin 25° = 272.1 \times 0.4226 = 115.0^K$

$\Delta_H = 60 \times 0.4663 = 28.0'$

30° $L_1 = \frac{60}{\cos 30} = \frac{60}{0.8660} = 69.3'$ $L_2 = 24.2$

$\cos\beta = \frac{20}{24.2} = 0.8264$ $\beta = 34° 20'$

$P_C = \frac{185}{\sin\beta} = \frac{185}{0.5640} = 328.0^K$

$P_H = 328.0 \times \sin 30 = 328.0 \times 0.5000 = 164.0^K$

$\Delta_H = 60 \times 0.5774 = 34.6'$

34° $L = \frac{60}{\cos 34} = \frac{60}{0.8290} = 72.4'$ $L_2 = 21.1$

$\cos\beta = \frac{20}{21.1} = 0.9479$ $\beta = 18° 40'$

$P_C = \frac{185}{\sin\beta} = \frac{185}{0.3228} = 573.1^K$

$P_H = 573.1 \times \sin 34° = 573.1 \times 0.5592 = 320.5^K$

$\Delta H = 60 \times 0.6745 = 40.5'$

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COMPUTATION SHEET
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J. RAY MCDERMOTT & CO., INC.

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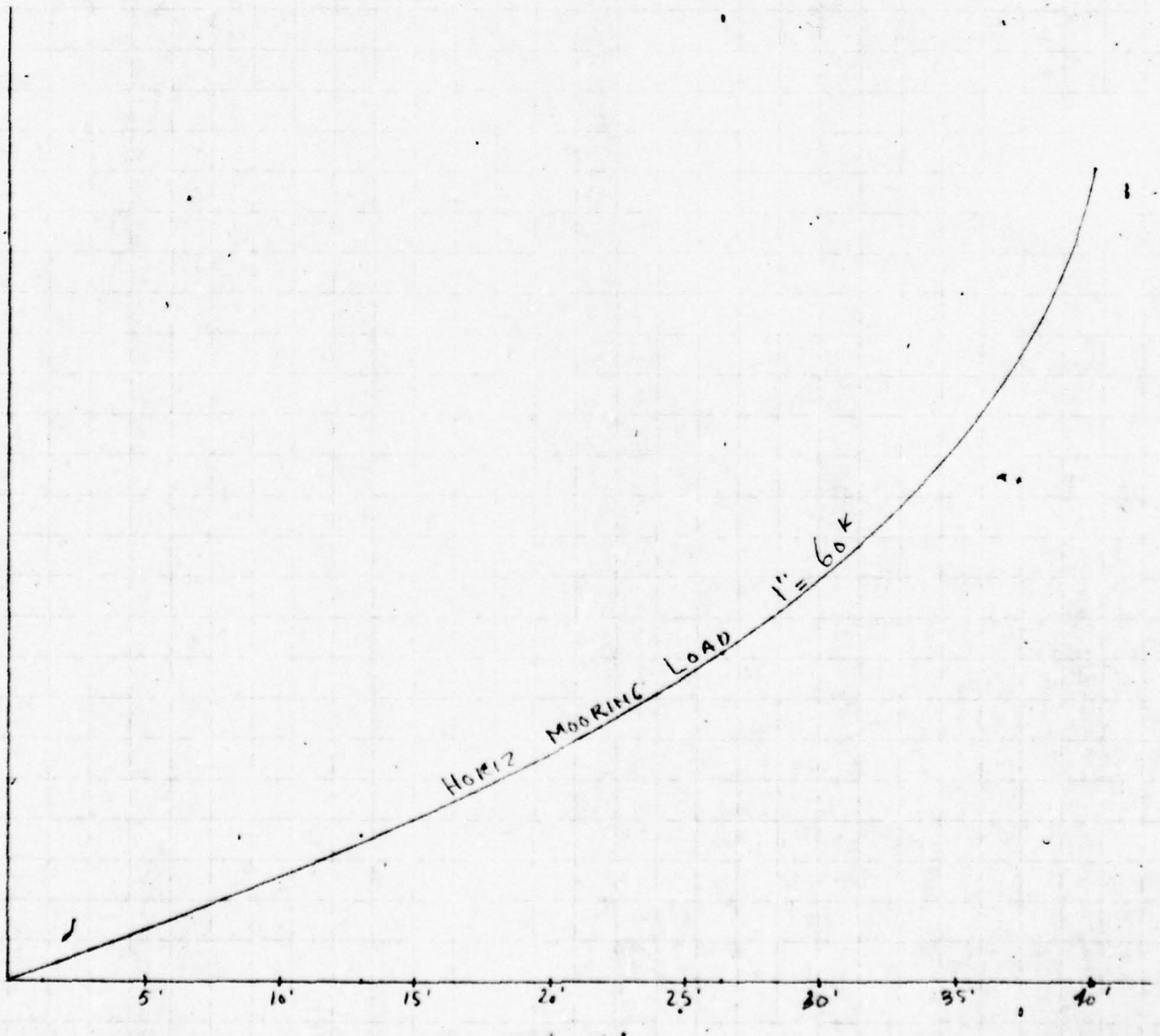
SUBJECT			
DRAWING NUMBER	COMPUTER N d B	CHECKED BY	DATE 4-25-66

150' WD
Buoy 40' ℓ DIAM x 17'ϕ
COUNTER WT 400K
12 ANCHORS



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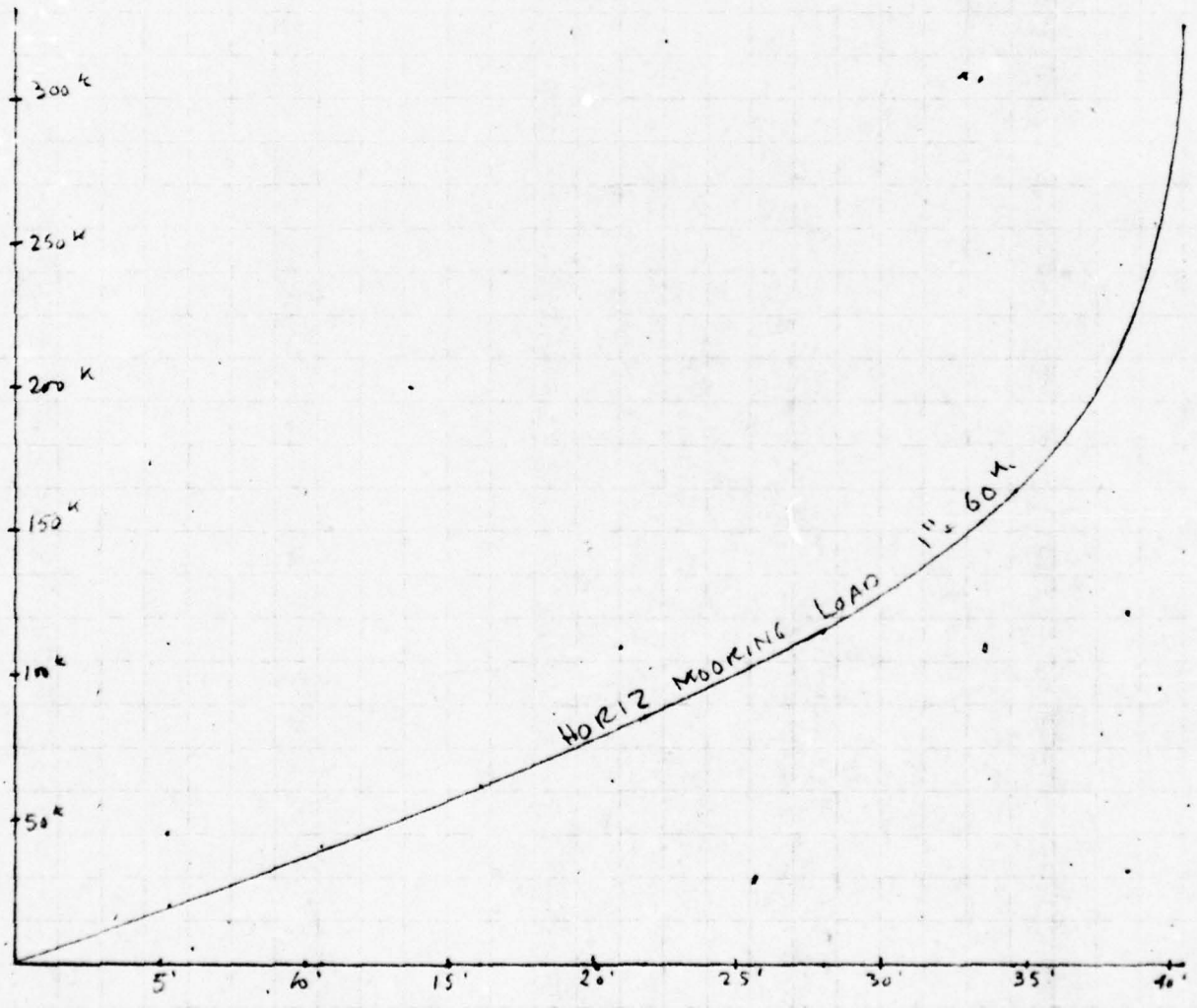
J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO.
SUBJECT			
DRAWING NUMBER	COMPUTER N dB	CHECKED BY	DATE 1-25-66

60' WD
BUOY 40' ℓ DIAM x 17' ϕ
COUNTER WT 185K
6 ANCHORS



EXCURSION 1" = 6'

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO
CHECKING MOTION STUDY			
SUBJECT: COMPUTER OUT PUT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

70,000 DWT TANKER LOADED DRAFT $X = 20°$

$L = 831.9$ $B = 102$ $\Delta = 204,985$ $T_W = 12$ $A = \frac{831.9}{4} = 208'$

$\Sigma_Z(\gamma)$: $\Sigma\psi(\gamma)$:

$T_H = 9.8$ $T_P = 12.0$ $T_R = 12.0$ $TSU = 6815$ $TSW = 8,903$

$TSY = 639,019,271$

$\Sigma_Z(\gamma) = 0.22$ $\Sigma\psi(\gamma) = 0.30$ $\theta_{MP} = 0.0401$ $\theta_{MR} = 0.0146$

$\mu_Z = 2.0$ $\mu_\psi = 2.7$ $\mu_\phi = 5.2$

		DOUBLE AMPL.
$A_{HEAVE} = 5.0 \times 0.22 \times 2.0 = 2.2'$		4.4'
$A_{PITCH} = 0.0401 \times 0.30 \times 2.7 = 0.0325$ RAD $= 1.86°$		3.7°
$A_{ROLL} = 0.0146 \times 5.2 = 0.0759$ RAD $= 4.35°$		8.7°
$A_{SURGE} = \frac{0.0401 \times 0.30 \times 204,985}{6,815 \times 0.27} = \frac{2460}{1,840} = 1.34'$		2.7'
$A_{SWAY} = \frac{0.0146 \times (1.30 \times 204,985)}{8,903 \times 0.27} = \frac{898}{2,404} = 0.38'$		0.8'
$A_{YAW} = \frac{0.0146 \times 204,985 \times 210}{639,019,271 \times 0.27} = \frac{628,184}{172,535,203} = 0.0036$ RAD $= 0.21°$		0.4°

AT BUOY $2A_{HEAVE} = 1.8'$

$2A_{PITCH} = 13.65'$

$2A_{ROLL} = 7.74'$

$2A_{SURGE} = 2.7'$

$2A_{YAW} = 1.5'$

$K_H = 0.5$ $K_{SD} = 0.3$
$K_P = 0.9$ $K_{SW} = 0.5$
$K_R = 0.2$ $K_Y = 0.9$

ENGINEERING DEPARTMENT
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J. RAY McDERMOTT & CO., INC.

COMPANY	SHEET NO
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DWT = 22,500 L = 579.2 B = 77.0
DRAFT LOADED Δ = 70,099 χ = 0° A = $\frac{522.2 + 100}{2}$ = 389.6
T_H = 8.2 T_P = 10.0 T_R = 10.2, M_{SD} = 2,325, M_{SW} = 3126
J = 107,889,965 H = 10
T_W = 10° μ_H = 2.0 μ_P = 2.7 μ_R = ——

E_Z = 0.17 E_ψ = 0.27 θ_{MP} = 0.0613 θ_{MR} = 0.0

$A_{MH} = \frac{10}{2} \times 0.17 \times 2.0 = 1.7°$

$A_{MP} = 0.0613 \times 0.27 \times 2.7 = 0.0447$ RAD

$A_{MR} = 0.0 \times 0.0 = 0$

$A_{MSD} = \frac{0.0613 \times 0.27 \times 70,099 \times 10^2}{6.28^2 \times 2,325} = \frac{116,022}{91,698} = 1.3°$

$A_{MSW} = \frac{0.0 \times 0.27 \times 70,099 \times 10^2}{3126 \times 6.28^2} = 0.0$

$A_{MY} = \frac{0.0 \times 70,099 \times -128.0 \times 10^2}{107,889,965 \times 6.28^2} = 0.0$

ϵ_H = 30° ϵ_P = 68° ϵ_R = R ϵ_{SD} = 72° ϵ_{SW} = 65° ϵ_Y = 68°

ENGINEERING DEPARTMENT
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J. RAY MCDERMOTT & CO., INC.

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SURGE

			SIN	
0	78	78	0.97437	× 1.3 = 1.27
30	108	72	0.95106	= 1.24
60	138	42	0.66913	= 0.87
90	168	12	0.20791	= 0.27
120	198	−12	−0.30902	= −0.40
150	228	−42	−0.74314	= −0.97
180	258	−78	−0.97437	= −1.27
210	288	−72	−0.95106	= −1.24
240	318	−42	−0.66913	= −0.87
270	348	−12	−0.20791	= −0.27
300	18	12	0.30902	= 0.40
330	48	42	0.74314	= 0.97

SWAY = 0.00
YAW = 0.00

	X	Y	Z	P	R	Y
0	1.27	0	17.62	2.56	0	0
30	1.24	0	18.10			
60	0.87	0	13.72			
90	0.27	0	5.67			
120	−0.40	0	−3.89			
150	−0.97	0	−12.92			
180	−1.27	0	−17.62			
210	−1.24	0	−18.10			
240	−0.87	0	−13.72			
270	−0.27	0	−5.67			
300	0.40	0	3.89			
330	0.97	0	12.92			

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J. RAY McDERMOTT & Co., INC.

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HEAVE.

0°	30	30	0.86603	× 1.7	= +1.47
30°	60	60	0.50000		= +0.85
60°	90	90	0.00000		= +0.00
90°	120	-60	-0.50000		= -0.85
120°	150	-30	-0.86603		= -1.47
150	180	-0	-1.00000		= -1.70
180	210	-30	-0.86603		= -1.47
210	240	-60	-0.50000		= -0.85
240	270	-90	0.00000		= +0.00
270	300	+60	0.50000		= +0.85
300	330	+30	0.86603		= +1.47
330	0	+0	1.00000		= +1.70
360	30	+30			

PITCH

			SIN		
0	68	68	0.92718	× 17.415	= 16.15
30	98	+82	0.99027		= 17.25
60	128	+52	0.78801		= 13.72
90	158	+22	0.37461		= 6.52
120	188	-8	-0.13917		= -2.42
150	218	-38	-0.61566		= -10.72
180	248	-68	-0.92718		= -16.15
210	278	-82	-0.99027		= -17.25
240	308	-52	-0.78801		= -13.72
270	338	-22	-0.37461		= -6.52
300	08	8.	0.13917		= 2.42
330	38	38	0.61566		= 10.72

ROLL

0.00

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY

SHEET NO 22

SUBJECT VOIDED SHEET

DRAWING NUMBER | COMPUTER | CHECKED BY | DATE 11-22-65

M 22,500 DWT LIGHT

Tw	λ	M_z	λ	M_ϕ	λ	M_ϕ	λ	M_x	λ	M_y	λ	M_θ
6	1.05	2.1	1.35	1.2	1.67	0.7	1.10	2.6	13.50	0.04		
7	0.90	2.2	1.16	2.5	1.43	1.0	0.94	3.4	11.57	0.05		
8	0.79	2.0	1.01	5.1	1.25	1.5	0.83	2.7	10.13	0.05		
9	0.70	1.7	0.90	4.0	1.11	2.2	0.73	2.1	9.00	0.06		
10	0.63	1.5	0.81	2.6	1.00	2.7	0.66	1.7	8.10	0.07		
11	0.57	1.4	0.74	2.3	0.91	2.7	0.60	1.6	7.36	0.07		
12	0.53	1.3	0.68	1.9	0.83	2.3	0.55	1.5	6.75	0.08		
13	0.48	1.3	0.62	1.7	0.77	2.0	0.51	1.4	6.23	0.09		

M 46000 DWT LOADED

	λ	M_z	λ	M_ϕ	λ	M_ϕ	λ	M_x	λ	M_y	λ	M_θ
6	1.52	0.8	1.82	0.5	1.83	0.5	2.42	0.3	29.13	0.02		
7	1.30	1.2	1.56	0.8	1.57	0.7	2.07	0.4	20.69	0.02		
8	1.14	1.8	1.36	1.2	1.38	1.1	1.81	0.5	18.10	0.03		
9	1.01	2.2	1.21	2.0	1.22	1.7	1.61	0.7	16.09	0.03		
10	0.91	2.2	1.09	3.2	1.10	2.2	1.45	0.9	14.48	0.04		
11	0.83	2.1	0.99	5.1	1.00	2.7	1.32	1.2	13.16	0.04		
12	0.76	1.8	0.91	4.0	0.92	2.7	1.21	1.8	12.07	0.04		
13	0.70	1.7	0.84	3.2	0.85	2.5	1.12	2.5	11.14	0.05		

M 46.000 DWT BALLAST

	λ	M_z	λ	M_ϕ	λ	M_ϕ	λ	M_x	λ	M_y	λ	M_θ
6	1.32	1.2	1.83	0.5	1.82	0.5	1.80	0.5	21.88	0.02		
7	1.13	1.7	1.57	0.7	1.56	0.7	1.54	0.8	18.76	0.03		
8	0.99	2.2	1.38	1.2	1.36	1.2	1.35	1.2	16.41	0.03		
9	0.88	2.2	1.22	1.9	1.21	1.7	1.20	1.9	14.59	0.04		
10	0.79	2.0	1.10	3.2	1.09	2.2	1.08	2.7	13.13	0.04		
11	0.72	1.8	1.00	5.2	0.99	2.7	0.98	3.5	11.94	0.04		
12	0.66	1.6	0.92	4.0	0.91	2.7	0.90	3.2	10.94	0.05		
13	0.61	1.5	0.85	3.2	0.84	2.3	0.83	2.7	10.10	0.05		

ENGINEERING DEPARTMENT
COMPUTATION SHEET
McD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY | SHEET NO. 23

SUBJECT

DRAWING NUMBER | COMPUTER | CHECKED BY | DATE 11-22-65

46,000 DWT LIGHT

	λ	M_z	λ	M_ϕ	λ	M_ψ	λ	M_x	λ	M_y	λ	M_θ
6	1.20	1.6	1.60	0.7	1.83	0.5	1.43	0.9	20.93	0.02		
7	1.03	2.1	1.37	1.2	1.57	0.8	1.23	1.6	17.51	0.03		
8	0.90	2.2	1.20	2.1	1.38	1.1	1.08	2.7	15.33	0.03		
9	0.80	2.0	1.07	4.0	1.22	1.7	0.96	3.4	13.62	0.04		
10	0.72	1.8	0.96	5.2	1.10	2.2	0.86	2.8	12.26	0.04		
11	0.65	1.6	0.87	3.5	1.00	2.7	0.78	2.3	11.15	0.05		
12	0.60	1.5	0.80	2.6	0.92	2.7	0.72	2.0	10.22	0.05		
13	0.55	1.4	0.74	2.3	0.85	2.5	0.66	1.7	9.43	0.06		

70000 DWT LOADED

	λ	M_z	λ	M_ϕ	λ	M_ψ	λ	M_x	λ	M_y	λ	M_θ
6	1.63	0.7	2.00	0.4	2.00	0.4	3.23	0.2	30.67	0.02		
7	1.40	1.0	1.71	0.6	1.71	0.6	2.77	0.2	26.29	0.02		
8	1.23	1.4	1.50	0.8	1.50	0.8	2.43	0.3	23.00	0.02		
9	1.09	1.9	1.33	1.2	1.33	1.2	2.16	0.3	20.44	0.02		
10	0.98	2.2	1.20	2.0	1.20	1.7	1.94	0.4	18.40	0.03		
11	0.89	2.2	1.09	3.2	1.09	2.2	1.76	0.5	16.73	0.03		
12	0.82	2.0	1.00	5.2	1.00	2.7	1.62	0.6	15.33	0.03		
13	0.75	1.7	0.92	4.2	0.92	2.7	1.49	0.8	14.15	0.04		

70 000 DWT BALLAST

	λ	M_z	λ	M_ϕ	λ	M_ψ	λ	M_x	λ	M_y	λ	M_θ
6	1.40	1.0	1.97	0.4	2.08	0.3	2,38	0.3	8773	0.02		
7	1.20	1.6	1.69	0.6	1.79	0.5	2.04	0.4	23.77	0.02		
8	1.05	2.1	1.48	0.8	1.56	0.7	1.79	0.5	20.80	0.02		
9	0.93	2.2	1.31	1.3	1.39	1.0	1.59	0.7	18.49	0.03		
10	0.84	2.1	1.18	2.1	1.25	1.3	1.43	0.9	16.64	0.03		
11	0.76	1.8	1.07	4.0	1.14	2.0	1.30	1.3	15.13	0.03		
12	0 70	1.7	0.98	5.2	1.04	2.5	1.19	1,9	13.87	0 04		
13	0.65	1.6	0.91	4.0	0.96	2.7	1.10	2.6	12.80	0.04		

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & Co. INC.

COMPANY			SHEET NO 24
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE 11-22-65

70,000 DWT LIGHT

	1	M_z	1	M_4	1	M_Φ	1	M_x	1	M_y	1	M_z
6	1.28	1.3	1.72	0.5	2.02	0.5	1.92	0.9	25.93	0.02		
7	1.10	1.8	1.47	0.9	1.73	0.6	1.69	0.7	22.23	0.02		
8	0.96	2.3	1.29	1.9	1.51	0.8	1.44	1.0	19.45	0.03		
9	0.86	2.2	1.14	2.5	1.34	1.2	1.28	1.4	17.29	0.03		
10	0.77	1.8	1.03	4.6	1.21	1.7	1.15	2.2	15.56	0.03		
11	0.70	1.7	0.94	4.8	1.10	2.2	1.05	3.2	14.15	0.04		
12	0.64	1.6	0.86	3.2	1.01	2.7	0.96	3.4	12.97	0.04		
13	0.59	1.5	0.79	2.5	0.93	2.7	0.88	3.1	11.97	0.04		

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO 25
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE 11-24-65

60' W.D

$\Delta L_{1,5}$	H_1	H_5	$\Delta L_{2,4,6,8}$	$0.707 \times (H_2 + H_8)$	$0.707 \times (H_4 + H_6)$	$\Delta L_{1,}$
0	6.0	-6.0	0	8.5	-8.5	0
2.5	9.0	-5.0	1.8	18.3	-7.1	2.5
5	10.2	-4.5	3.5	14.1	-6.4	5
7.5	18.0	-4.0	5.3	17.0	-5.9	7.5
10	28.0	-3.5	7.1	24.0	-5.5	10
12.5	51.0	-3.0	8.8	32.5	-4.9	12.5
15	117.0	-2.5	10.6	45.2	-4.5	15
16.25	200.0	-2.3	12.5	58.0	-4.2	17.5
						20
						22.5
						25
						27.5

ΔL	$F_{H\ 60'}$	ΔL	$F_{H\ 150'}$
0	0	0	0
2.5	0.2	2.5	11.1
5	13.4	5	25.0
7.5	25.1	7.5	38.0
10	43.0	10	52.5
12.5	75.6	12.5	67.8
15	155.2	15	89.0
16.25	251.5	17.5	111.4
		20	139.0
		22.6	175.5
		25	212.2
		27.5	280.0

HORIZONTAL ANCHOR FORCES IN 60' WD & 150' WD

-65

150' WD

$\frac{1}{2}(H_3+H_6)$	$\Delta_{1,5}$	H_1	H_5	$\Delta_{2,4,6,8}$	$0.707(H_2+H_8)$	$0.707(H_4+H_6)$
8.6	0	24.0	-24.0	0	+33.8	-33.9
7.1	2.5	27.0	-21.5	1.8	+36.0	-30.4
6.4	5	31.0	-18.0	3.5	+39.6	-27.6
5.9	7.5	35.5	-16.5	5.3	+44.5	-25.5
5.5	10	41.5	-14.5	7.1	+49.9	-24.0
4.9	12.5	49.0	-13.0	8.8	+53.7	-21.9
4.5	15	59.0	-11.0	10.6	+61.5	-20.5
4.2	17.5	71.0	-10.5	12.4	+69.3	-18.9
	20	87.0	-9.5	14.1	+77.8	-16.3
	22.5	111.0	-9.0	15.9	+89.1	-15.6
	25	132.5	-8.0	17.7	+102.5	-14.8
	27.5	183.0	-7.0	19.4	+112.4	-13.9

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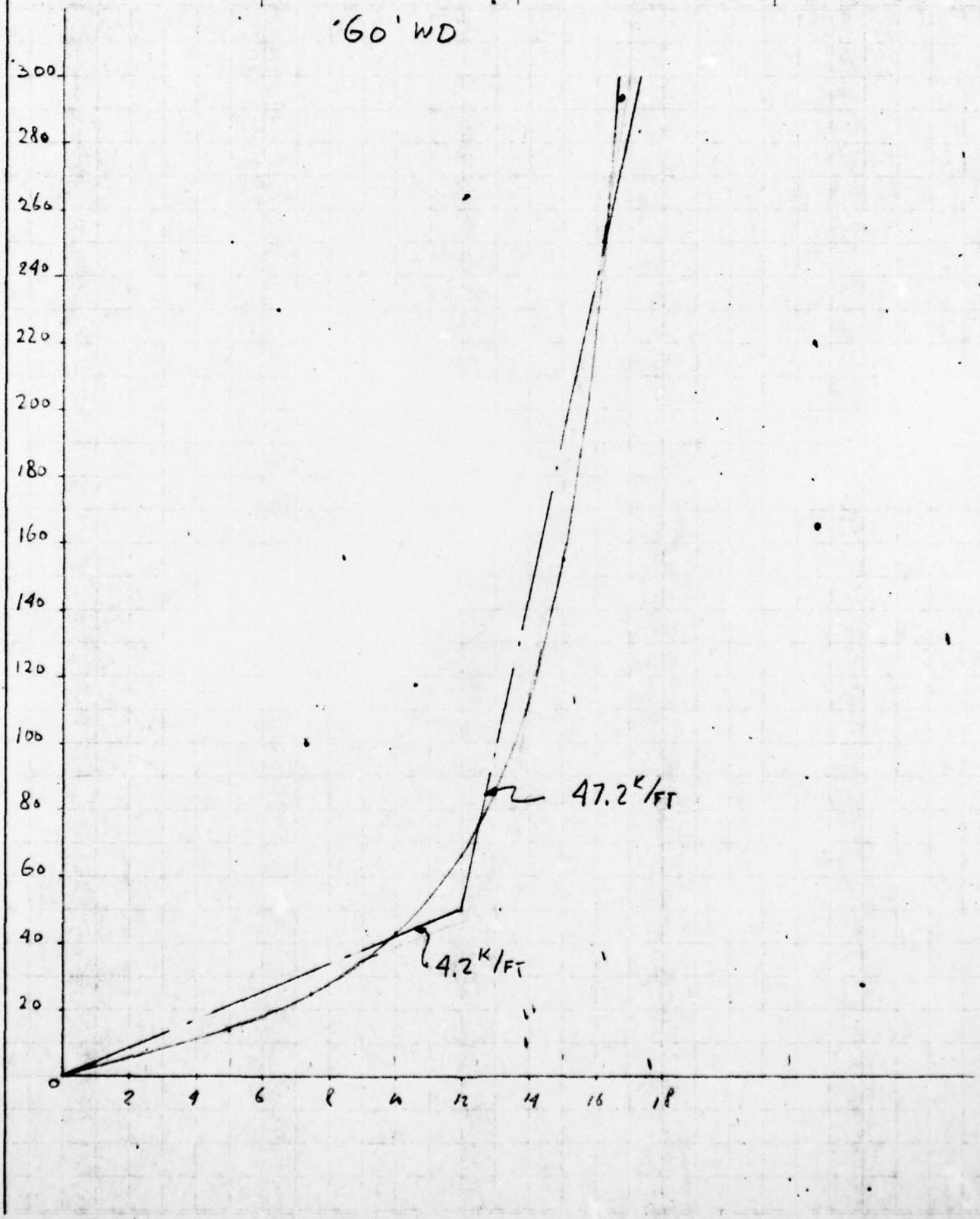
ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

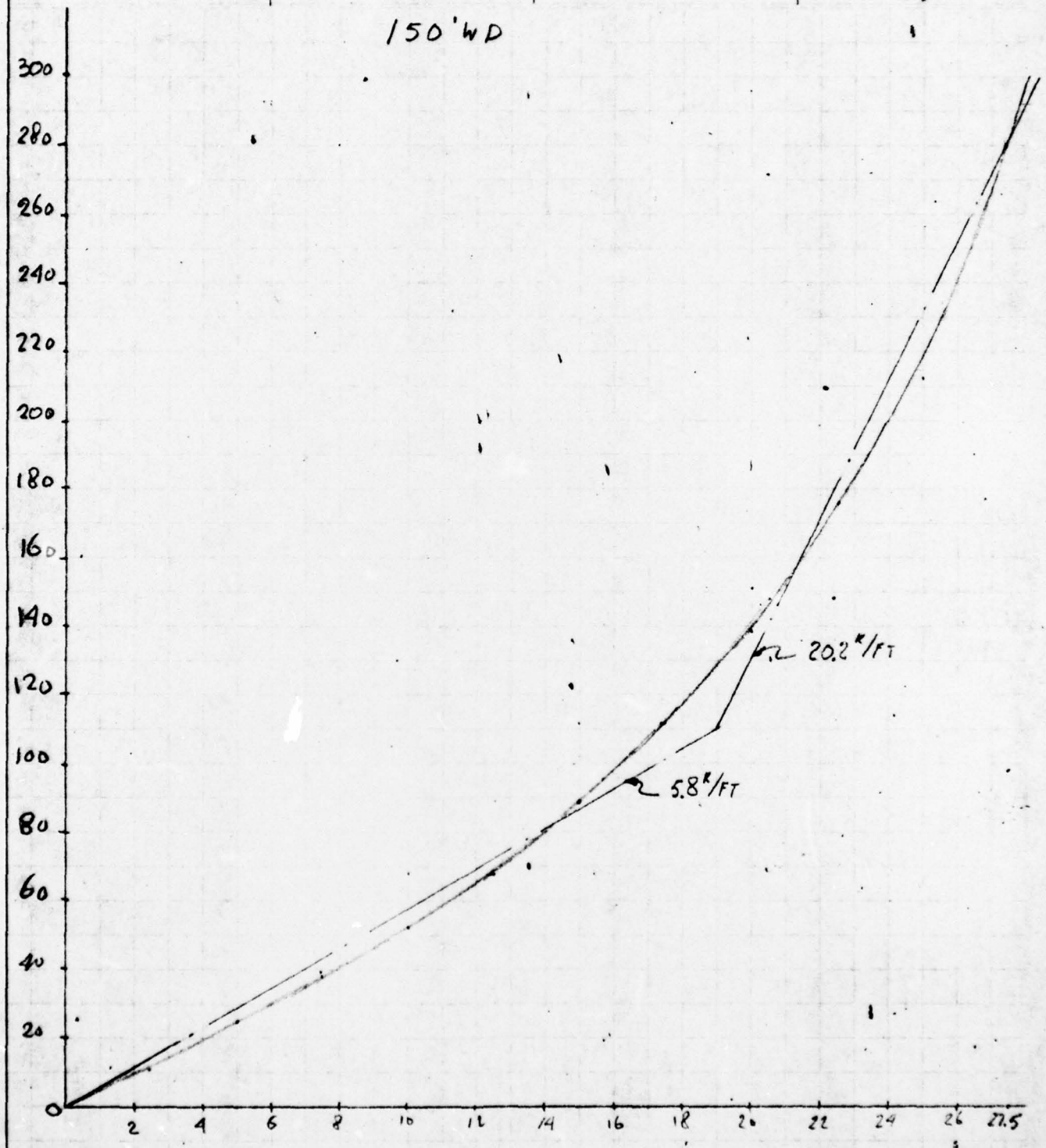
COMPANY			SHEET NO 26
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE 11-29-65



ENGINEERING DEPARTMENT
COMPUTATION SHEET
McD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO. 27
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE 11-29-65



ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO. 28
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE 11-29-65

22,500 DWT 60' WD

LOADED

$$T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 47.2}{4,766}}} = \frac{6.28}{\sqrt{0.3189}} = \frac{6.28}{0.565} = 11.1 \text{ SEC}$$

BALLAST

$$T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 47.2}{2,618}}} = \frac{6.28}{\sqrt{0.5805}} = \frac{6.28}{0.762} = 8.2 \text{ SEC}$$

LIGHT

$$T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 47.2}{1,662}}} = \frac{6.28}{\sqrt{0.9144}} = \frac{6.28}{0.956} = 6.6 \text{ SEC}$$

46,000 DWT 60' WD

LOADED

$$T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 47.2}{8,082}}} = \frac{6.28}{\sqrt{0.1880}} = \frac{6.28}{0.433} = 14.5 \text{ SEC}$$

BALLAST

$$T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 47.2}{4,447}}} = \frac{6.28}{\sqrt{0.3418}} = \frac{6.28}{0.584} = 10.8 \text{ SEC}$$

LIGHT

$$T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 47.2}{2,822}}} = \frac{6.28}{\sqrt{0.5386}} = \frac{6.28}{0.733} = 8.6 \text{ SEC}$$

70,000 DWT 60' W.D.

LOADED $T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 47.2}{14,441}}} = \frac{6.28}{\sqrt{0.1052}} = \frac{6.28}{0.324} = 19.4 \text{ SEC}$

BALLAST $T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 47.2}{7,942}}} = \frac{6.28}{\sqrt{0.1914}} = \frac{6.28}{0.438} = 14.3 \text{ SEC}$

LIGHT $T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 47.2}{5,054}}} = \frac{6.28}{\sqrt{0.3007}} = \frac{6.28}{0.548} = 11.5 \text{ SEC}$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO 29
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE 11-29-61

22,500 DWT 150' WD

LOADED $T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 20.2}{4,766}}} = \frac{6.28}{\sqrt{0.1365}} = \frac{6.28}{0.370} = 17.0$ SEC

BALLAST $T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 20.2}{2,618}}} = \frac{6.28}{\sqrt{0.2484}} = \frac{6.28}{0.498} = 12.6$ SEC

LIGHT $T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 20.2}{1,662}}} = \frac{6.28}{\sqrt{0.3913}} = \frac{6.28}{0.625} = 10.0$ SEC

46,000 DWT 150' WD

LOADED $T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 20.2}{8,082}}} = \frac{6.28}{\sqrt{0.0805}} = \frac{6.28}{0.284} = 22.1$ SEC

BALLAST $T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 20.2}{4,447}}} = \frac{6.28}{\sqrt{0.1463}} = \frac{6.28}{0.383} = 16.4$ SEC

LIGHT $T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 20.2}{2,822}}} = \frac{6.28}{\sqrt{0.2305}} = \frac{6.28}{0.479} = 13.1$ SEC

70,000 DWT 150' WD

LOADED $T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 20.2}{14,441}}} = \frac{6.28}{\sqrt{0.0450}} = \frac{6.28}{0.212} = 29.6$ SEC

BALLAST $T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 20.2}{7,942}}} = \frac{6.28}{\sqrt{0.0819}} = \frac{6.28}{0.286} = 22.0$ SEC

LIGHT $T_{SURGE} = \frac{6.28}{\sqrt{\frac{32.2 \times 20.2}{5,054}}} = \frac{6.28}{\sqrt{0.1287}} = \frac{6.28}{0.359} = 17.5$ SEC

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 8015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO 30
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE 11-29-65

22,500 DWT 60'W.D. ½L+100'

LOADED $T_{SWAY} = T_{YAW} = \frac{1.108 \times 192.8}{\sqrt{\frac{(0.5 \times 579.2 \times 100)^2 \times 4.2}{131,595}}} = \frac{1.108 \times 192.8}{\sqrt{\frac{637,510}{131,595}}} = \frac{213.6}{\sqrt{4.85}} = \frac{213.6}{2.20} = 97.1$ SEC

BALLAST $T_{SWAY} = T_{YAW} = \frac{1.108 \times 205.9}{\sqrt{\frac{637,510}{92,846}}} = \frac{1.108 \times 205.9}{\sqrt{6.87}} = \frac{228.14}{2.62} = 87.1$ SEC

LIGHT $T_{SWAY} = T_{YAW} = \frac{1.108 \times 219.3}{\sqrt{\frac{637,510}{79,513}}} = \frac{1.108 \times 219.3}{\sqrt{8.56}} = \frac{237.44}{2.93} = 81.0$ SEC

46,000 DWT 60'WD ½L+100'

LOADED $T_{SWAY} = T_{YAW} = \frac{1.108 \times 240.5}{\sqrt{\frac{884,860}{261,986}}} = \frac{1.108 \times 240.5}{\sqrt{3.38}} = \frac{266.47}{1.84} = 144.8$ SEC

BALLAST $T_{SWAY} = T_{YAW} = \frac{1.108 \times 256.0}{\sqrt{\frac{884,860}{190,103}}} = \frac{1.108 \times 256.0}{\sqrt{4.65}} = \frac{283.65}{2.16} = 131.3$ SEC

LIGHT $T_{SWAY} = T_{YAW} = \frac{1.108 \times 265.6}{\sqrt{\frac{884,860}{159,218}}} = \frac{1.108 \times 265.6}{\sqrt{5.74}} = \frac{294.28}{2.40} = 122.6$ SEC

70,000 DWT 60'W.D. ½L+100'

LOADED $T_{SWAY} = T_{YAW} = \frac{1.108 \times 280.6}{\sqrt{\frac{1,133,934}{400,116}}} = \frac{1.108 \times 280.6}{\sqrt{2.83}} = \frac{310.90}{1.69} = 184.0$ SEC

BALLAST $T_{SWAY} = T_{YAW} = \frac{1.108 \times 298.9}{\sqrt{\frac{1,133,934}{286,479}}} = \frac{1.108 \times 298.9}{\sqrt{3.96}} = \frac{331.18}{1.99} = 166.4$ SEC

LIGHT $T_{SWAY} = T_{YAW} = \frac{1.108 \times 310.4}{\sqrt{\frac{1,133,934}{231,538}}} = \frac{1.108 \times 310.4}{\sqrt{4.90}} = \frac{343.92}{2.21} = 155.6$ SEC

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO 31
SUBJECT			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE 11-29-65

22,500 DWT 150' WD ½L+100'

LOADED $T_{SWAY} = T_{YAW} = \frac{1.108 \times 192.8}{\sqrt{\frac{880,372}{131,545}}} = \frac{1.108 \times 192.8}{\sqrt{6.69}} = \frac{913.62}{2.59} = 88.5$ SEC

BALLAST $T_{SWAY} = T_{YAW} = \frac{1.108 \times 205.9}{\sqrt{\frac{880,372}{92,846}}} = \frac{1.108 \times 205.9}{\sqrt{3.48}} = \frac{228.14}{3.08} = 74.1$ SEC

LIGHT $T_{SWAY} = T_{YAW} = \frac{1.108 \times 219.3}{\sqrt{\frac{880,372}{79,513}}} = \frac{1.108 \times 219.3}{\sqrt{11.82}} = \frac{237.49}{3.44} = 69.0$ SEC

46,000 DWT 150' WD ½L+100'

LOADED $T_{SWAY} = T_{YAW} = \frac{1.108 \times 240.5}{\sqrt{\frac{1,221,950}{261,986}}} = \frac{1.108 \times 240.5}{\sqrt{4.66}} = \frac{266.47}{2.16} = 123.4$ SEC

BALLAST $T_{SWAY} = T_{YAW} = \frac{1.108 \times 256.0}{\sqrt{\frac{1,221,950}{190,103}}} = \frac{1.108 \times 256.0}{\sqrt{6.43}} = \frac{283.65}{2.54} = 111.7$ SEC

LIGHT $T_{SWAY} = T_{YAW} = \frac{1.108 \times 265.6}{\sqrt{\frac{1,221,950}{154,218}}} = \frac{1.108 \times 265.6}{\sqrt{7.92}} = \frac{294.28}{2.82} = 104.4$ SEC

70,000 DWT 150' WD ½L+100'

LOADED $T_{SWAY} = T_{YAW} = \frac{1.108 \times 280.6}{\sqrt{\frac{1,565,908}{400,116}}} = \frac{1.108 \times 280.6}{\sqrt{3.91}} = \frac{310.90}{1.98} = 157.0$ SEC

BALLAST $T_{SWAY} = T_{YAW} = \frac{1.108 \times 298.9}{\sqrt{\frac{1,565,202}{286,474}}} = \frac{1.108 \times 298.9}{\sqrt{5.47}} = \frac{331.18}{2.34} = 141.5$ SEC

LIGHT $T_{SWAY} = T_{YAW} = \frac{1.108 \times 310.4}{\sqrt{\frac{1,565,202}{231,538}}} = \frac{1.108 \times 310.4}{\sqrt{6.76}} = \frac{343.92}{2.60} = 132.3$ SEC

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MOD 9015

J. RAY MCDERMOTT & CO., INC.

COMPANY	SHEET NO.
SUBJECT	
DRAWING NUMBER / COMPUTER / CHECKED BY / DATE	

HARMONIC MOTION

Z = SINGLE AMPLITUDE.

$$\text{VELOCITY} = \frac{2\pi Z}{T}$$

$$\text{ACCELERATION} = Z \times \left(\frac{2\pi}{T}\right)^2 = \frac{\text{FORCE}}{\text{MASS}} = \frac{\text{MOM}}{\text{POLAR MASS MOM. OF INERTIA}}$$

$$Z = \frac{\text{FORCE}}{\text{MASS}} \times \left(\frac{T}{2\pi}\right)^2$$

$$Z = \frac{\text{MOMENT}}{\text{POLAR MASS MOM OF INERTIA}} \times \left(\frac{T}{2\pi}\right)^2$$

TANKERS T = LOADED DRAFT $\sim$ 0.72 DEPTH

BALLAST CONDITION $T_{AFT} = 0.8\,T$ $T_{FWD} = 0.3\,T$

LIGHT CONDITION $T_L = 0.26\,T$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO 2
SUBJECT	VOID		
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

BALLAST

$KM = 1.1\ KM_{LOADED}$

$KM_L = 1.05\ KM_{L\ LOADED}$

$T_R = \frac{1.108\,k}{\sqrt{GM}} = 10.3,\ 10.7,\ 11.1$

$T_P = \frac{1.108\,k_L}{\sqrt{GM_L}} = 10.5,\ 11.0,\ 11.5$

LIGHT

$KM = 1.3\ KM_{LOADED}$

$KM_L = 1.2\ KM_{L\ LOADED}$

$k = 18.6,\ 19.3,\ 20.0$

$k_L = 228.4,\ 266.1,\ 301.0$

22,500	46,500	70,000
KG = 21.7	KG = 25.4	KG = 31.1
KM = 25.7	KM = 29.4	KM = 35.1
KM_L = 601.0	KM_L = 743.0	KM_L = 870.0

BALLAST

31,294 × 21.7 =	59,156 × 25.4 =	91,511 × 31.1 =
− 15,647 × 22.0 =	− 29,578 × 26.0 =	− 45,755 × 32.0 =
15,647 × 21.4 =	29,578 × 24.8 =	45,756 × 30.2 =

KM = 28.3	KM_L = 631	KM = 32.3	KM_L = 780	KM = 38.6	KM_L = 919
KG = 21.4	KG = 21.4	KG = 24.8	KG = 24.8	KG = 30.2	KG = 30.2
GM = 6.9	GM_L = 609.6	GM = 7.5	GM_L = 755.2	GM = 8.4	GM_L = 883.8

LIGHT

31,294 × 21.7 =	59,156 × 25.4 =	91,511 × 31.1 =
− 21,906 × 22.0 =	− 41,409 × 26 =	− 64,058 × 32 =
9,388 × 21.0 =	17,747 × 24 =	27,453 × 29.0 =

KM = 33.4	KM_L = 721.2	KM = 38.2	KM_L = 891.6	KM = 45.6	KM_L = 1,099.0
KG = 21.0	KG = 21.0	KG = 24.0	KG = 24.0	KG = 29.0	KG = 29.0
GM = 12.4	GM_L = 700.2	GM = 14.2	GM_L = 867.6	GM = 16.6	GM_L = 1,070.0

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 5015

J. RAY MCDERMOTT & CO., INC.

COMPANY			SHEET NO 3
SUBJECT: VOID			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

BALLAST

$J_L = 228.4^2 \times 31,294 = 1,633,500,329$

$\frac{1}{12} \times 1.8 \times 15,647 \times (579^2 + 42.7^2) =$
$= 791,106,061$

$K_L = \sqrt{\frac{841,394,268}{15,647}} = 231.9$

$T_P = \frac{1.108 \times 231.9}{\sqrt{\underset{29.7}{609.6}}} = 10.4 \text{ SEC}$

$J_L = 266.1^2 \times 59,156 = 4,188,283,627$

$\frac{1}{12} \times 1.8 \times 29,578 \times (718.0^2 + 50.0^2) =$
$= 2,298,317,081$

$K_L = \sqrt{\frac{1,890,472,546}{29,578}} = 252.8$

$T_P = \frac{1.108 \times 252.8}{\sqrt{\underset{27.5}{755.2}}} = 10.2 \text{ SEC}$

$J_L = 301.0^2 \times 91,511 = 8,290,988,111$

$\frac{1}{12} \times 1.8 \times 45,755 \times (839.1^2 + 60.0^2) =$
$= 4,857,044,242$

$K_L = \sqrt{\frac{3,433,943,869}{45,756}} = 274.0$

$T_P = \frac{1.108 \times 274.0}{\sqrt{\underset{29.7}{883.8}}} = 10.2 \text{ SEC}$

LIGHT

$\frac{1}{12} \times 1.8 \times 21,906 \times (579^2 + 42.7^2) =$
$= 1,107,558,598$

$K_L = \sqrt{\frac{524,941,731}{2,388}} = 236.5$

$T_P = \frac{1.108 \times 236.5}{\sqrt{\underset{26.5}{706.2}}} = 9.9 \text{ SEC}$

$\frac{1}{12} \times 1.8 \times 41,409 \times (718.0^2 + 50.0^2) =$
$= 3,217,628,372$

$K_L = \sqrt{\frac{370,161,252}{17,797}} = 233.9$

$T_P = \frac{1.108 \times 233.9}{\sqrt{\underset{29.7}{883.8}}} = 8.7 \text{ SEC}$

$\frac{1}{12} \times 1.8 \times 64,058 \times (839.1^2 + 60.0^2) =$
$= 6,799,968,091.$

$K_L = \sqrt{\frac{1,491,020,820}{27,453}} = 253.0$

$T_P = \frac{1.108 \times 253.0}{\sqrt{\underset{32.3}{1,044.4}}} = 8.7 \text{ SEC}$

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 8015

J. RAY McDERMOTT & CO., INC.

COMPANY			SHEET NO 4
SUBJECT: VOID			
DRAWING NUMBER	COMPUTER	CHECKED BY	DATE

BALLAST

$J_T = 18.6^2 \times 31,294 = 10,827,724$

$\frac{1}{12} \times 1.8 \times 15,647 \times (77^2 + 42.7^2) =$
18,199,332

$K_T = \sqrt{\frac{\quad}{15,647}}$

$T_R = \frac{1.108 \times}{\sqrt{6.9}}$
2.63

$J_T = 19.3^2 \times 59,156 = 22,035,610$

$\frac{1}{12} \times 1.8 \times 29,578 \times (102^2 + 50^2) =$

$K_T = \sqrt{\frac{\quad}{29,578}}$

$T_R = \frac{1.108 \times}{\sqrt{7.5}}$
2.74

$J_T = 20.0^2 \times 91,511 = 36,609,400$

$\frac{1}{12} \times 1.8 \times 45,756 \times (165^2 + 60^2) =$

$K_T = \sqrt{\frac{\quad}{45,578}}$

$T_R = \frac{1.108 \times}{\sqrt{8.4}}$
2.910

LIGHT

$\frac{1}{12} \times 1.8 \times 21,906 \times (77^2 + 42.7^2) =$
25,472,297

$K_T = \sqrt{\frac{\quad}{9,388}} =$

$T_R = \frac{1.108 \times}{\sqrt{12.4}} =$
3.52

$\frac{1}{12} \times 1.8 \times 41,409 (102^2 + 50^2) =$

$K_T = \sqrt{\frac{\quad}{17,797}} =$

$T_R = \frac{1.108 \times}{\sqrt{14.2}} =$
3.77

$\frac{1}{12} \times 1.8 \times 69,058 \times (115^2 + 60^2) =$

$K_T = \sqrt{\frac{\quad}{27,753}} =$

$T_R = \frac{1.108 \times}{\sqrt{16.6}} =$
4.07

ENGINEERING DEPARTMENT
COMPUTATION SHEET
MCD 14003

J. RAY McDERMOTT & CO., INC.

COMPANY | SHEET NO

SUBJECT

DRAWING NUMBER | COMPUTER | CHECKED BY | DATE

Dwt	$L_{O.A.}$	L_{WL}	B	D	LOADED	BALLAST		LIGHT	LOADED	BALLAST	LIGHT	LOADED			
					T	T_A	T_F	T	Δ	Δ	Δ	T_H	T_R	T	T_S
22,500	595	579.2	77.0	42.7	32.4	25.9	9.7	11.3	34,294	15,697	9,388	8.0	10.3	10	
46,000	736	718.0	102.0	50.0	37.8	30.2	11.3	13.2	59,156	29,578	17,797	8.5	10.7	10	
70,000	859	839.1	115.0	60.0	44.0	35.2	13.2	15.4	91,511	45,756	27,453	9.2	11.1	11	

	LOADED			BALLAST			LIGHT			LOADED				
	K/FT	GM	GM_L	K/FT	GM	GM_L	K/FT	GM	GM_L	α	M_{WH}	M_{WS}	M_{VSW}	
	2,109.0	4	580	2,340.5	6.9	610	2,246.3	12.7	700	0.849	71,044	70,1		2
	3,904.9	4	720	3,805.9	7.5	760	3,663	14.2	870	0.833	134,042	132,0		2
	5,163.0	4	840	5,027.1	8.9	880	4,841.8	16.6	1,040	0.836	207,011	205,1		3

VUV

LOADED					BALLAST						LIGHT						
T_R	T_P	T_S	T_{SW}	T_Y	T_H	T_R	T_P	T_S	T_{SW}	T_Y	T_H	T_R	T_P	T_S	T_{SW}	T_Y	
10.3	10					10.1	10.4					9.6	9.9				
10.7	10					9.7	10.2					8.4	8.7				
11.1	10					9.6	10.2					8.3	8.7				

LOADED					BALLAST						LIGHT						
M_{VH}	M_{VS}	M_{VSW}	$K_P \cdot K_Y$	K_R	α	M_{VH}	M_{VS}	M_{VSW}	$K_P \cdot K_Y$	K_R	α	M_{VH}	M_{VS}	M_{VSW}	$K_P \cdot K_Y$	T_R	
71,044	70,1		228.4	18.6	0.880	35,953	35,883		231.9	24.0	0.787	21,910	21,050		236.5	30.5	
134,042	132,0		266.1	19.3	0.802	67,720	66,309		252.8	24.0	0.782	41,181	39,787		238.9	28.6	
202,011	205,1		300	20.0	0.814	104,430	102,563		274.0	25.1	0.784	63,783	61,540		253.0	30.5	

2